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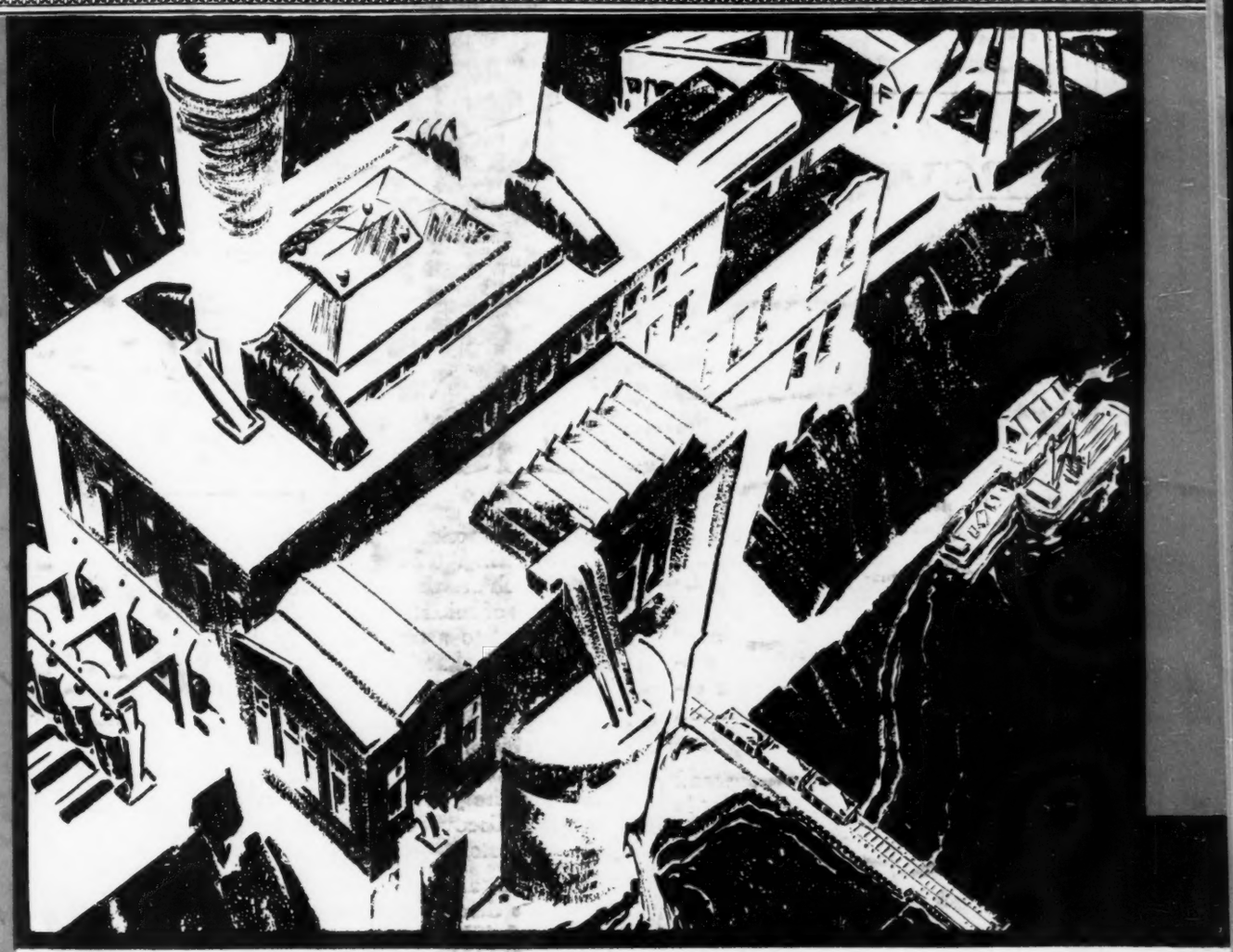

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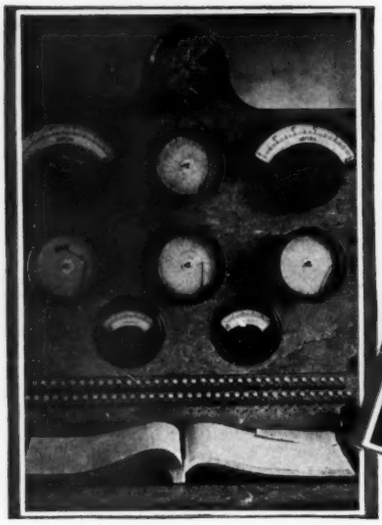

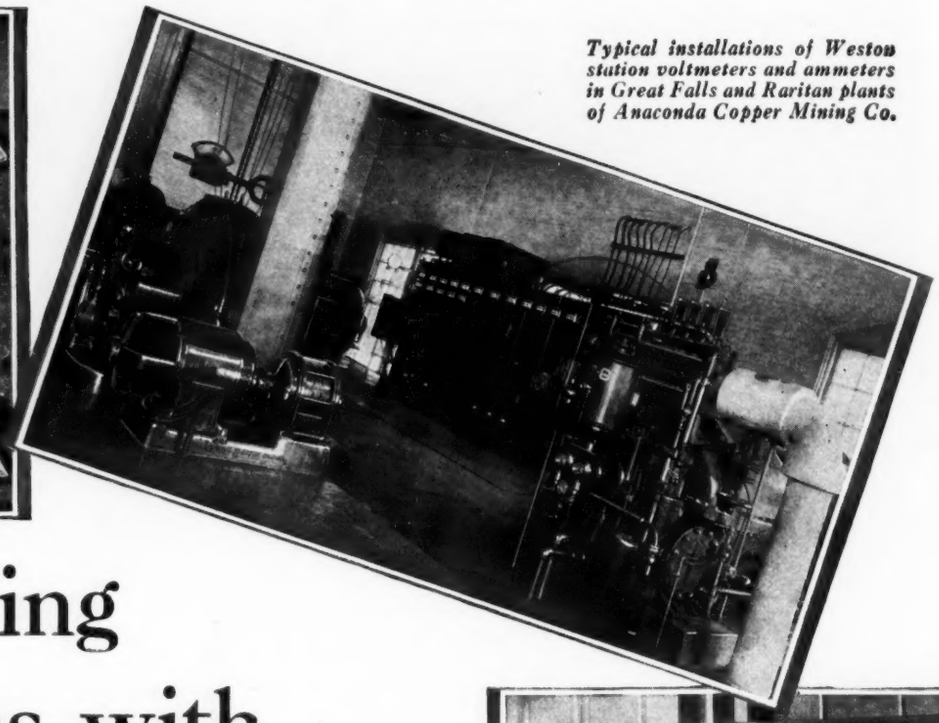

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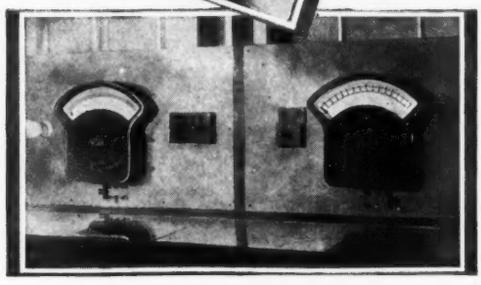

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L. W. W. MORROW, *Editor*

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Facts Needed to Save Investment

ELECTRIC utility executives have added their discreet sirens to the tocsin sounded by the chairman of the N.E.L.A. Engineering Section. If the alarm is not heeded, rising investment costs per kilovolt-ampere installed will put a halt to lowered rates, increased sales and maintenance of fair recovery on the investment. One executive is inclined to the opinion that the hustle and bustle of keeping up with the load demand has prevented a full development of the system-planning procedure. In addition, the rapid evolution of new apparatus and methods has meant that the interchange of ideas on efficacious or economical designs and construction methods has not appeared wholly profitable because of the lack of a common ground.

With the present degree of standardization on equipment and system schemes there is now a common ground and, at the moment, a common incentive to deliver for the common good the fruits of economic experience. Such items as estimates made to justify the purchase of new equipment because of what it will save in operation should be made public at group meetings and in every other way for the benefit of the industry. New system layouts that conserve capital, new labor-saving and space-saving devices should have the results arising from their adoption presented.

Concentration of power production into fewer, bigger and better power plants has reduced proportionately the investment in them. Conversely, the greatly increased area served by a single plant has similarly increased directly the proportion of total system investment devoted to the transmission, distribution and substation elements. Both influences tend to throw the burden of proof upon the distribution engineer.

* * * *

Effect of Apartment Houses on Electric Utilities

THE trend toward apartment-house dwelling, so noticeable in New York, Chicago and many other large cities where as much as 80 per cent of the total housing units in new dwellings are apartments, calls for serious study on the part of metropolitan public utility companies. While it is difficult to determine as yet what effect this movement will have on the social, economic and political life of the community, it has certainly made some changes in the character, life and customs of apartment-house dwellers, and these should be determined.

Naturally, apartment houses are large users of electricity for elevator and other services and because of that they enjoy rather low rates. Moreover, since many meters can thereby be supplied from a single service, certain advantages accrue to the electric light and power company. However, there are other factors which should be evaluated. Many of the newer apartment houses provide vacuum-cleaning and refrigerator service as part of the rent. Laundry work is usually performed outside, and cooking is gradually being reduced to a minimum. The whole idea in apartment houses is to make them labor-saving, and to that end the space per inhabitant is also being reduced so as to keep the rent per room within bounds. Thus there is little that the modern "cliffdweller" can do with electricity which he himself purchases and pays for.

For this reason the relationship of the apartment-house dweller to the future growth of the electric light and power business in congested metropolitan and even suburban centers will bear investigation. In a community with individual or two-party houses the opportunities for increased use of electricity per meter are tremendous. Does the same hold true for apartment-house dwellers? That should be an ascertainable fact, and once determined it should guide future rates and actions of metropolitan companies.

* * * *

Local Engineering Responsibility in Holding Companies

DURING the transition period associated with the co-ordination of a local power company with a new controlling centralized organization the question of local engineering responsibility must be faced with frankness. Design, construction and operation are all affected by the policy determined upon. The objective of a well-managed grouping of properties with respect to engineering should be to realize the advantages of centralization without loss of local understanding of problems conditioned by the situation of the subsidiary utility. This can be done if headquarters puts the right amount of responsibility upon the engineers most intimately acquainted with local conditions and co-operates helpfully with them, instead of trying to govern local developments on a mandate basis giving little or no room for the exercise of initiative and originality by resident members of the organization.

Final decisions may properly be made by headquarters, and will be so made in general, but only after local viewpoints have been carefully considered. It ought to be self-evident, but is not, that money will be saved and more effectively expended from both investment and operating standpoints if the engineers on the subsidiary properties receive wide latitude as headquarters representatives permanently in the field, instead of being restricted to routine repetitive work with little more than technical errand-boy responsibility.

Just what does this mean? In design it means getting the local engineer's "slant" on both principles and details of proposed developments, instead of mailing him a set of standard layouts to be accepted "as is." It means seeking full and complete criticism of the program and methods of carrying it out, in operation and construction as well as in design. It may mean setting a local design zone in which certain grades of structure may be put through without headquarters supervision. It certainly means giving the local man a voice in the selection of apparatus and supplies requiring engineering ability in their purchase and adaptation. If this voice be given, the benefits of centralized purchasing can still be had, with the added strength contributed to the process by including the local engineer's viewpoint instead of trying, for whatever reason, to ram inappropriate material down the line into the local system. Selection is of supreme importance in engineering purchasing, and neither a local office nor a headquarters establishment should be allowed to "ride" the other in such activities. Co-operation is the true basis.

* * * *

Electrified Farms Bring the Best Prices

IN THIS enlightened age the owner of an unwired dwelling or flat has to be content with a relatively lower sale or rental value than one that offers immediate opportunity to the new tenant to retain membership in the fraternity of the electrically favored. In the cities there are so few in this predicament that they are now identified as in a class apart.

However, the rural districts are still viewed from the opposite angle. The electrified farm has acquired an incremental value exceeding the cost of the electrical installation. But in many areas the absence of the electrical aids does not constitute the deterrent it should be to ready marketability of the farm. This will come as certainly as the next tide obeys the inexorable, but in the meantime the new business agents can well use both arguments in their approach to the farmers.

* * * *

A Budget Transgressor

EXTRAVAGANCE is too severe a term to apply to the attitude toward expenditures on the part of those who are responsible for the design and construction of distribution systems. Generosity or liberality might better characterize the comments of some executives on the budget transgressions of the distribution engineers and superintendents. Some of them have been heard to complain that there is no other company department that so often and so far exceeds in its requests the amount ultimately allocated in the year's fiscal program.

Is this situation due to a state of mind of the engineers or is it due to the irremediable circumstances created by the new service situations? It would be interesting to know just what increases in unit generation, transmission and distribution costs have taken place in the last few years and what they were caused by. Such analyses would probably reveal the influence of trying to assure uninterrupted service and might serve as a guide to the degree of reliability justified in different cases of extension and reconstruction.

It is probably true that the attempt by the new-business group to attach new customers on the fringes of the system will result in an increase in the average value of distribution investment per customer. To cover the abnormal investment the prospective customer is induced by an appropriate rate, or otherwise, to engage in extensive use of the service. These added uses emphasize more and more the reliability of the service, and unfortunately the longer the extension the more will increasing service continuity prevent justifiable economies in construction.

Here is an opportunity for economical compromise between those who spend the company's dollar and those who are striving for the customer's dollar.

* * * *

Excursion Into Brobdingnag

A PILE of earth 218 feet high covering a circular area of 148,000 square feet. This Florida mountain represents the labor of one month performed by an electric shovel that is now digging out coal in southeastern Kansas. That shovel can, and frequently does, move more than 400,000 cubic yards of earth in a month. It is, for the moment, the largest shovel in the world to be used in a strip coal-mining operation. That is, it was, when the statement was originally made; possibly by the time this is printed another giant will have dwarfed it into the commonplace.

One asks, "What is the justification for the size of such mechanical behemoths?" There are really two justifications, one permissive and the other causative.

Let us take the permissive one first, for it supplies the reason for these remarks. Power shovels have gone through a large part of their development in the forms of self-contained units. Each machine produced its own power, which usually was mechanically applied. The shovel was burdened with a boiler and steam engine, or with an internal-combustion engine, and with a complexity of mechanical power control and utilization equipment. As shovels were built larger the equipment for producing and applying the power became heavier, more extensive and more complicated. Owing to the excessive vibration and frequent shocks, maintenance of these machines was a preponderant item in operating costs. Moreover, the increasing size and weight of the power production elements added such stresses and burdens to the structure as effectively to limit the possible working capacity for which a machine might be designed.

Electricity from an outside source of supply removed virtually all of the restrictions inherent in the self-generation of power. The equipment on the shovel need be only that required for the actual work of digging, and consequently it could be made larger and more powerful. Extreme vibration as a natural concomitant of operation disappeared. Control was simplified and made more readily responsive. The shovel could be designed and built to be what its function required it to be, a digger, not a combination of a digger and a peripatetic power plant. It followed naturally, then, that electric shovels could be—and were—made larger than their self-powered predecessors.

And there are more reasons for the breeding of a race of giants in electric shovels. One is that, on account of the omission of energy production machinery, the electric shovel costs less than the others. Another reason is that power can be purchased at less cost, generally speaking, than it can be produced on the shovel.

Now as to the causative justification of these giant devices. It is just this: There is plenty of work for

them to do. In the strip mining of coal the operation became uneconomical for horses and scrapers when a vein of coal less than three feet in depth lay under an earth overburden of more than twelve feet. Steam shovels do not often remove more than twenty feet of earth. But the electric shovel can go down 40 feet for 30 inches of coal and compete with deep-mine production. The rule of thumb is that one foot of overburden can be removed for each inch in thickness of the coal vein below. The economic reason for big shovels is easily apparent.

* * * *

Anticipating Faults vs. Isolating After Occurrence

MOST of the methods used for the protection of electrical apparatus, such as generators or transformers, take advantage of a change in one of the electrical values, such as current or voltage for operating relays, which either instantaneously disconnect the particular piece of apparatus or warn the operator to be on his guard. Thus, in the case of short circuit in a coil in a generator or transformer, the differential protection will at once function and disconnect the generator or tranformer instantaneously and prevent further damage to the apparatus itself and other equipment.

Such protection can only function after a short circuit has actually happened, but it cannot give any warning that the insulation at a certain spot is approaching the breakdown point. The Buchholtz protection, which has been in successful use on transformers in Europe for some time, claims to solve this problem. It takes advantage of the fact, found by many experiments, that many hours before a coil becomes short circuited decomposition takes place in the insulation and fine particles of this deteriorating insulation are moving about in the surrounding medium. By a comparatively simple and ingenious method the presence of such particles is made to operate a relay.

And now it is announced that a similar arrangement has been devised for generators, taking advantage of the fact that the heat-reflecting quality of these decomposition particles is different from that of air. It was found that a faulty coil in a large turbo-generator was reported twenty hours before it broke down. It was also found that moisture in the air, hydrogen or CO_2 have no influence whatever on the correct functioning of this method. It is further claimed that the method is quite free from the troublesome tripping of breakers through other causes when there is no fault at all.

The idea sounds ingenious and interesting. But is it as practical as it is ingenious? When it detects a faulty coil before the coil fails and notifies the operator, it would take a very careful inspection to find exactly where the fault is. Then the coil would have to be removed anyhow. On the other hand, it is possible to obtain differential relays now which will trip the breaker before any damage is done to the iron, so that with this method also only one coil would have to be replaced. If the Buchholtz protection were installed on large units in this country the operator would not be satisfied to depend on this protection only, but would require the usual differential protection in addition, so that the new method may in some cases mean additional complications.

Nevertheless, this new method should be subjected to serious study in this country and should be given a fair trial. Experience alone will show if and how far its application can be made useful.

Electric Power Services and Water Supply

THAT electric power service in mills and factories is of great social consequence is not always appreciated even by those engaged in the business. And yet many men are temporarily thrown out of employment and whole communities suffer a loss which might be avoided if the whole story of purchased power were known. England today is making appeals for most rigid economy in the use of water by householders, and so severe is the drought there that mills in some sections have been shut down for a week's holiday in order to conserve the water supply. Now, as every one knows, the problem of unemployment has been severe in England for some time, and to have to throw more people out of work because of water shortage is lamentable. Obviously, the more general electrification of mills and factories through purchased power is indicated as the right source of remedy.

We have been faced with similar situations in this country and our interconnected superpower systems have come to the rescue. Most manufacturing processes do not require water. It is only where the factory possesses its own steam-generating plant that any appreciable amount of water is needed. When there is drought human beings come first and factories last. And yet how often have we cited the cases of mills in North Carolina operating to capacity despite local drought, with electric power relayed from Alabama. Formerly these have had to shut down and the whole community was thrown out of work because of lack of rain. Now, thanks to purchased power, the employees can afford to buy bottled water if necessary, and drought has lost all its terrors to the community, its factories and its people.

* * * *

Lowest Transmission Investment Not Always Most Economical

ENGINEERS planning lines for transmitting a given amount of power under certain conditions of load factor, power factor and distance always, of course, take into consideration all annual charges, including power loss, and select the most economical voltage and conductor size for the particular line.

An interesting case in point that shows the relation between original capital investment and net transmission cost of power delivered is to be found in the design of a line for a new hydro-electric project on the Pacific Coast. For the distanee and amount of power involved 110 kv. was the lowest voltage considered, and the choice rested between this and 220 kv. It was found that while the first cost of the 110-kv. line, including certain system changes, was 10 per cent less than for the 220-kv. line, the over-all cost of power delivered at the receiving substation was 23 per cent more per kilowatt-hour for the 110-kv. line than for the 220-kv. line. This, coupled with the fact that 220-kv. transmission in California has been found to be equally reliable with 110-kv. operation, naturally led to choice of the higher voltage.

This and similar cases which might be cited in connection with power plants and other component parts of utility systems simply serve to prove that the design which will give lowest first cost is not always necessarily the most economical when due consideration is given to maintenance, operating costs and other factors.

Of the Race of Titans

BEFORE electricity was applied to mechanical shovels they were limited in size by the fact that each unit must be burdened by its own power production equipment. But electricity has removed that restriction and now energy utilization machinery is all that need be carried. The only limit on shovel size now is the boundary of imagination and engineering audacity of designers. Here is a rather breath-taking example, digging out coal in the strip mines of Kansas. It is a Bucyrus-Erie type 750-B with a 16-yd. bucket. This is stated to be the largest strip mine shovel in the world, and from the way the Buick coupe nestles into its maw one is inclined to accept the statement. A view of the Marion type 350 12-yd. shovel traveling overland to a new coal seam in Kansas is shown on page 275.

Automatic Frequency Control

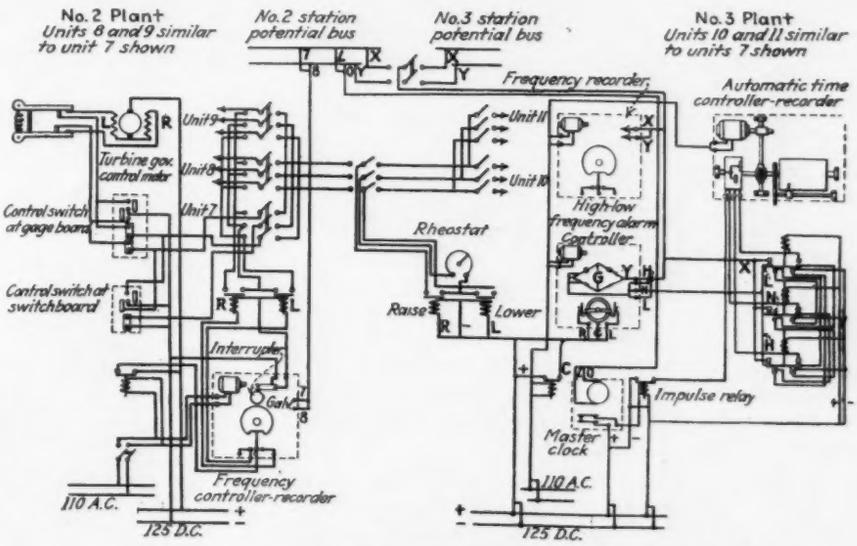
New equipment at Long Beach automatically maintains close frequency control. Speed time is checked by radio, stop watches and "second catcher"

By T. F. ROBERTSON

Chief Electrician Steam Generation Department
Southern California Edison Company, Los Angeles, Calif.

AUTOMATIC control methods that will hold system frequency within a range of speed-time error of two seconds fast or slow, with load increasing at as great a rate as 3,000 kw. per minute, have been developed by the Southern California Edison Company at its Long Beach steam plants. Introduction of synchronous motor-driven clocks has made the subject of speed time one of importance to every power company and has stimulated interest in automatic control of frequency and consequent system speed time. Before the introduction of synchronous motor-driven clocks in southern California, however, experiments with automatic frequency control were being conducted at the Long Beach steam plants. The first practical mechanism for controlling frequency automatically at Long Beach was made by attaching a disk to the shaft of an ordinary desk fan to provide an interrupter which was placed in the common wire of the turbine governor motor control circuit connected to the high and low frequency alarm contacts in the graphic frequency meter in use on the plant switchboard.

In order to secure impulses of such duration that a rapid response to changes in load would be secured and at the same time that "hunting" would be avoided required considerable experimental work.



Arrangement for Shifting Automatic Control to Any Generator

Various forms of cams were tried to secure a type that would give the best average frequency regulation throughout the range from no load to full load on the turbo-generator unit. In subsequent experimental work it was found that the characteristics of different turbine governors could be compensated for by introducing a rheostat in each control circuit. Later the interrupter cams were mounted directly on the rotating shaft which is a part of the frequency meter used. The apparatus perfected in this manner was used for commercial regulation of the Edison system for almost a year.

At first the high and low frequency contacts in the frequency meter were set to hold the frequency within a range of from 49.9 to 50.1 cycles, normal frequency on this system being 50 cycles. This range was gradually reduced to 49.95 to 50.05 cycles. The mechanism was so arranged that it could be used to regulate on any one of the three units in Long Beach steam plant No. 2. Two of the units have a net operating capacity of 42,500 kw., while the third is rated at 60,000 kw.

Continued use of the control apparatus just described demonstrated the desirability of having the impulse making contacts so constructed that the duration of the impulses sent to the governor motor would increase proportionally with the departure of frequency from the desired frequency. It was evident that such a controller would respond more rapidly to the large changes in load, which are frequent on a system such as that of the Southern California Edison Company, supplying power for the city and interurban railways in Los Angeles and contiguous territory and for large industrial areas.

NEW CONTROLLERS INSTALLED

Experimental work at Long Beach was watched closely by one of the large instrument manufacturers, and when Long Beach No. 3 plant was built this manufacturer had developed a controller in which the duration of contacts was proportional to the departure of frequency from the desired speed. One of these controllers was installed on the switchboard of plant No. 3 and is shown

Master Clock and Radio Receiver for Checking Time with Arlington

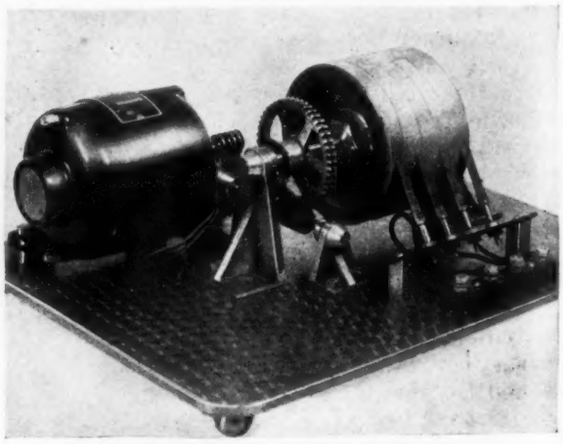
located below the frequency recorder in one of the accompanying illustrations. This controller has been in service about eight months regulating the 100,000-kw. unit in the No. 3 plant. As additional 100,000 kw. or larger units are installed in this plant they will be controlled by the instrument described. A frequency recorder controller of the same make has been installed on the No. 2 plant switchboard.

A very flexible scheme has been worked out so that one controller may be used to regulate the frequency of any machine in either No. 2 or No. 3 plant and the other to regulate on any machine in No. 2 plant. The wiring of this hook-up, as shown in an accompanying illustration, is so arranged that the operator can quickly switch automatic control from one unit to another. The operator also can instantly take the control from the automatic mechanism by turning the hand-regulating switch to either fast or slow position. This is a desirable feature at Long Beach, where it is not an uncommon occurrance to have increments of 15,000 kw. thrown on the plant. Changes of this magnitude are greater than any automatic mechanism so far developed will compensate for without a relatively wide swing in frequency. When a large change in load occurs suddenly an alarm warns the operator, enabling him to restore equilibrium manually and prevent a larger error in speed time. When regulating over the peak the procedure at Long Beach is to have the automatic control functioning on one machine, the other machines being on governor control at economical loads. When the regulating machine becomes fully loaded it is "blocked," using a device developed at Long Beach steam plants, and the automatic controller transferred to another machine.

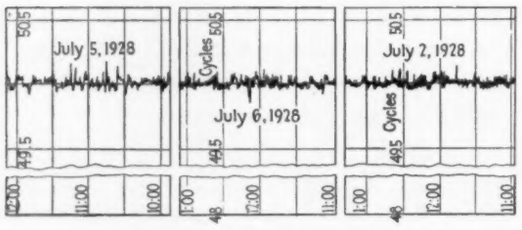
Cumulative Frequency Error

Extensive installation of synchronous motor-driven clocks by consumers added a new responsibility for service upon the shoulders of the central station and it became necessary for the Long Beach steam plants to eliminate cumulative errors in frequency or speed time. In this field it was found that Eastern companies were atte ıpting to maintain a correct speed time by using manual control and a master clock combining a synchronous motor-driven hand and a pendulum clock. A master clock of this type was installed in No. 3 plant and a short-wave radio receiving set was constructed to intercept time signals broadcast by naval radio station NAA, at Arlington, Va. By means of the radio time signals the pendulum time of the master clock was regulated. The speed-time error of the system was then shown by the master clock and the automatic frequency controller setting was manually changed to a new control value to correct cumulative errors in frequency or speed time. The speed time is noted each hour in the station log and errors compensated for at a rate of about one second per hour. The change in frequency necessary to compensate for speed-time error is shown graphically for both 50 cycles and 60 cycles in the accompanying illustrations.

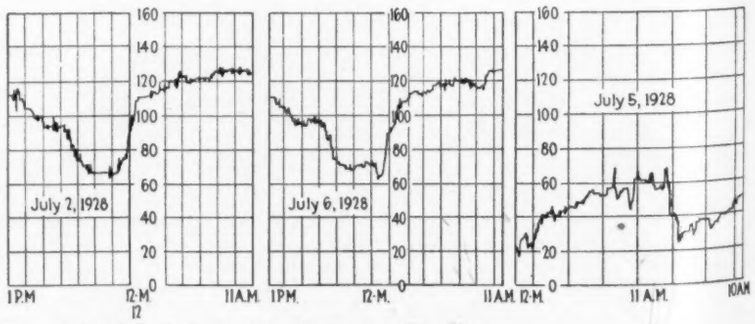
On the Edison system regulation of system frequency is divided between the Big Creek hydro plants and the



Device for Matching Speed Time with Pendulum Time



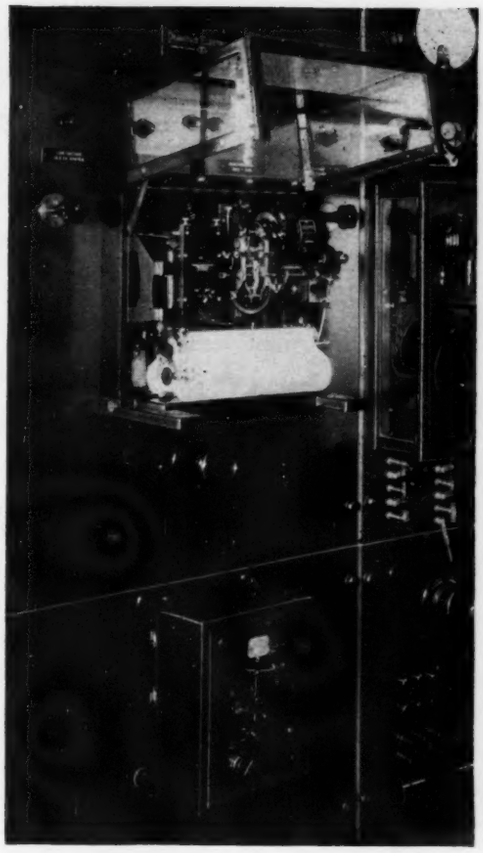
The loads corresponding to these intervals of time for which frequency is shown are plotted at the right.



Close Frequency Control Maintained Automatically

Long Beach steam plants, which are a distance of 280 miles apart. A master clock is used at Big Creek No. 3, which is the regulating plant of the Big Creek group of hydro plants, and a master clock is also located in the system central dispatcher's office located in the city of Alhambra, which is about 35 miles from Long Beach. To avoid confusion which might result from independent checking of pendulum time, it has been found desirable to centralize this function at Long Beach and make the Long Beach operator responsible for the speed time of the system.

Development of a workable technique of making time comparisons with radio time signals and checking pendulum time between clocks required considerable experiment. Direct visual comparison involved too great a human error and was abandoned. The use of a stop-watch was found to be the simplest and most accurate method. It is possible to determine speed time error to one-half second by the use of the stop-watch. The procedure is to start the watch by pressing the release the instant the time signal is heard from the loud speaker of the radio set. The time signal is on the minute and hour of 7 o'clock p.m. Pacific standard time and the watch measures the seconds from that time. As speed-time error on the system under discussion has never exceeded 12 seconds, the checking is limited to determining the seconds error. This is done by waiting until the second hand of the master clock is straight up on the even five minutes past the hour and stopping the watch at that instant. The position of the stop-watch hand will show the error, if any. The human "lag" in starting the stop-watch when the time signal is received is believed to be canceled by the similar delay in stopping the watch. The stop-watch method is used also in comparing time with Big Creek and Alhambra, starting the watch on a "ping" signal over the long-distance telephone line.

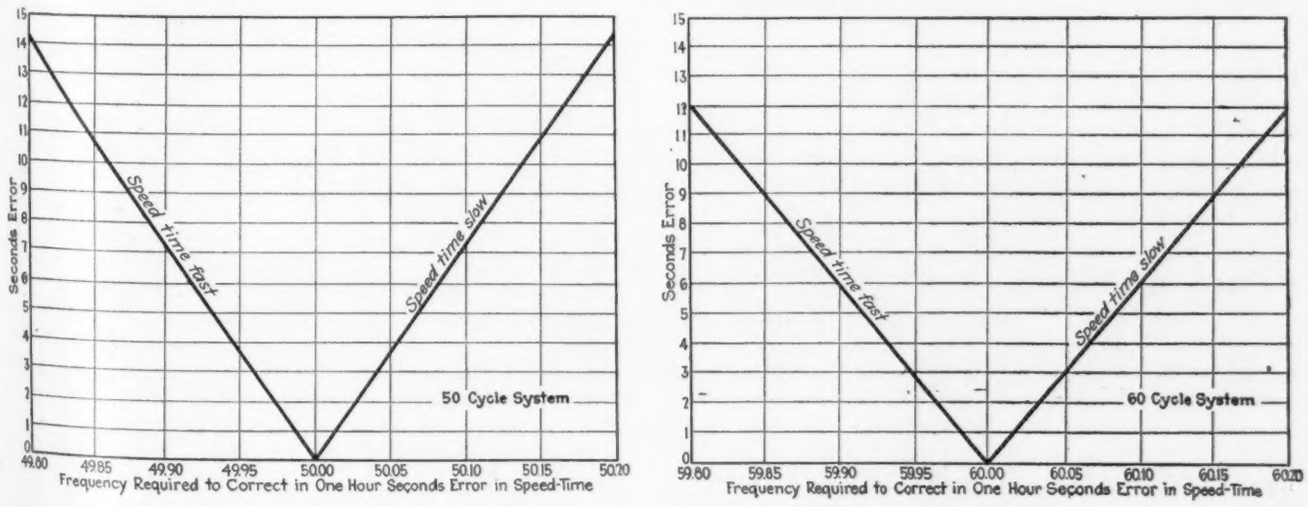


Frequency Recorder and Automatic Frequency Controller

Further development work is under way at Long Beach to perfect means of automatically biasing the frequency controllers to maintain accurate speed time and a mechanism for exactly checking system speed time with Naval Observatory time by means of vacuum tubes. A recording master clock also is on order.

A speed-time pendulum time device called the "second catcher" is now being used at Long Beach to bias the automatic frequency controller. This device, shown in one of the accompanying illustrations, was suggested and conceived by F. G. Philo, superintendent of steam generation of the Southern California Edison Company. It consists of a drum 15 in. in circumference driven by a synchronous motor at a speed of 1 r.p.m., so that $\frac{1}{4}$-in. travel of the circumference is equal to one second of time. The uninsulated portions of the drum close circuits through "fast," "neutral" or "slow" relays that effect a bias of 1/20 cycle in the automatic controller. The impulse that is sent over the biasing circuit is given exactly on the minute by an accurate pendulum clock which is regulated to Naval Observatory time. This "second catcher," as it is called, has simplified the function of control and improved the accuracy of the speed time of the Edison system.

It is interesting to recall that at the time the decision was made to experiment with automatic frequency control the market was searched in vain for equipment to accomplish the desired functions. So far as could be learned no company was using apparatus to effect automatic frequency or speed-time control, although a num-


Seconds Error
Speed time fast
Speed time slow
50 Cycle System
49.80 49.85 49.90 49.95 50.00 50.05 50.10 50.15 50.20
Frequency Required to Correct in One Hour Seconds Error in Speed-Time
Seconds Error
Speed time fast
Speed time slow
60 Cycle System
59.80 59.85 59.90 59.95 60.00 60.05 60.10 60.15 60.20
Frequency Required to Correct in One Hour Seconds Error in Speed-Time

Frequency Required to Correct a Given Time Error in One Hour

ber of companies were using master clocks and were maintaining very close control of their speed time. Many interesting schemes were proposed. One that was considered and discarded in favor of the deivce used, only because of its delicate mechanism and greater cost, was an apparatus using a mirror mounted on a balanced galvanometer needle. This mirror was to reflect a tiny beam of light as the frequency would swing and to focus the light ray on photo-electric cells mounted in the dark chamber. The cells through relays would send the fast or slow impulses to the turbine governor motor.

The art of automatic control is in its infancy. Many refinements will be forthcoming in rapid succession. Not only will complete automatic control of turbine speed to maintain accurate standard time be perfected, but the day is not far distant when this control will be extended to govern every function taking place in the power plant. It is felt that the subject of complete station automatic control should be studied as offering an opportunity for improving economy and reliability and to enable power companies of the country to render additional service by giving every home and office accurate standard time.

Electricity on the Farm

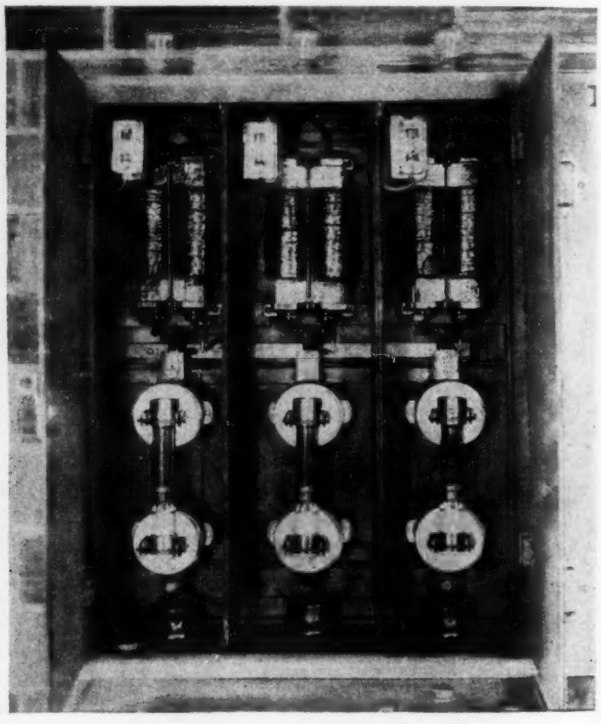
A recent check-up on eleven electrified farms discloses that there was an average of 33 lighting outlets per farmer and they used 330 kw.-hr. per year or 10 kw.-hr. per lighting outlet, according to the Iowa Committee on Public Utility Information. Electric ranges averaged 1,300 kw.-hr. per year. Milking machines used 330 and well water pumps 210. Radio, electric flatirons, washing machines and cream separators together took less than 200 kw.-hr. per year per farm.

Unit Type Switch and Control Gear

By F. R. Hussey

Columbia Engineering & Management Corporation, Cincinnati, Ohio

RECENTLY completed automatic, alternating-current substations on the system of the Union Gas & Electric Company, Cincinnati, Ohio, have embodied in them certain features of design which make toward economy of space and simplification of construction. Typical of these features are the unit type switch and control gears shown in the accompanying illustrations. Each unit is complete in itself, with all live parts inclosed in metal casing and each containing its own metering, relaying and control equipment. Live parts within the unit structure are taped and are air-insulated with liberal clearances phase to phase and phase to ground. Compartments may be compound filled if it is desired.



Space Savings Realized in Automatic Substation

Unit type switch and control gear and round type resistors mounted on insulators behind potential transformer fuse clip lead to economies in space.

The units were shipped from the factory of the Condit Electrical & Manufacturing Company completely assembled, except for the oil circuit breaker itself and the hinged switchboard panel. This type of structure brings space requirements to a minimum and obviates the necessity for separate switchboard panels. In eliminating the use of separate switchboards the need for the numerous complicated control conduit runs in the floor slab is done away with and appreciable economies are effected in labor cost for installation. Two types of units are illustrated in the picture. At the left is a three-phase operated unit for a transformer bank. The middle unit controls the transfer bus connections and

is also three-phase. At the right is a feeder circuit unit, each phase operated individually.

Above the transformer and transfer bus units are compartments for potential transformers and fuses and station power fuses. A feature of the potential transformer installation is the use of the new two-section, round type current-limiting resistors in series with the potential transformer fuses. This type of resistor makes possible a very appreciable saving in space over that required where the separate resistor is used mounted on top of the insulator supporting the fuse clip.

Reducing Lightning Damage to Wood Poles

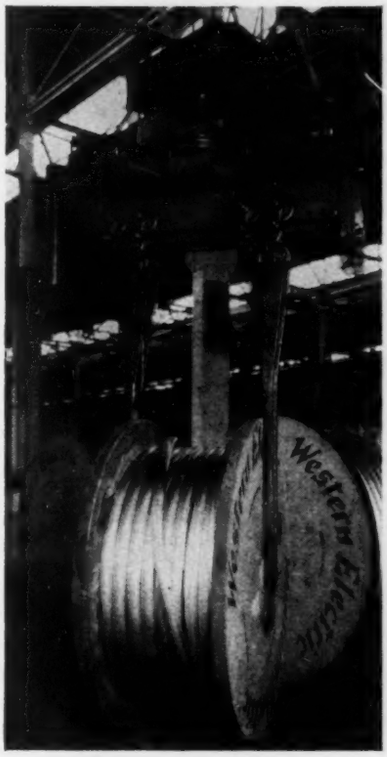
By B. E. Ellsworth

Engineer Iowa-Nebraska Light & Power Company
Lincoln, Neb.

A RAILROAD crossing, where it is necessary in some states to install metal crossarms, is frequently the place for a violent electrical display, particularly if the rest of the line is constructed of wooden poles with wooden crossarms. The grounded arm is a potential hazard because it is the weakest point in the line from the insulation standpoint. Increased insulation at these crossings does not always have the desired effect and lightning continues to jump to ground at these points. The best remedy is to leave off the ground plate wherever possible.

Trouble is experienced by lightning striking guyed "A" frames. The guy on these structures is usually placed near the top of the pole and presents an easy path to ground for any charge existing on the line conductors. The poles are sometimes split by the discharge. The remedy of this defect was found in lowering the guy to a point at least 5 ft. below the level of the lowest line conductor. The insulation of the wooden pole was thus preserved and the lightning damage to "A" frames eliminated. Southern yellow pine poles, due to the good conductivity, are much more likely to be damaged by lightning than Western red cedar.

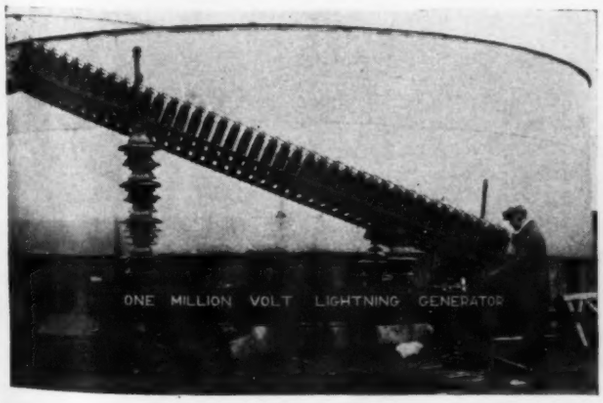
Grapple Expedites Handling of Cable Reels

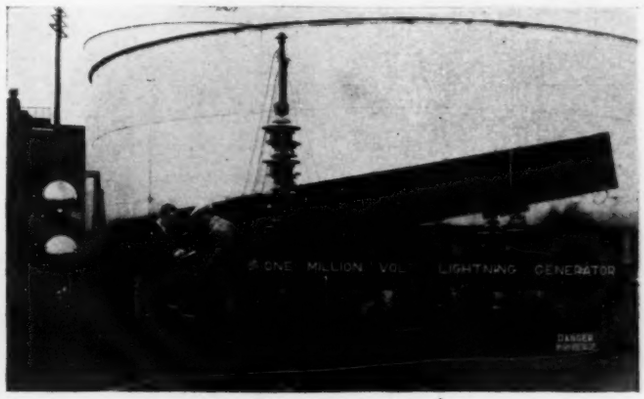


A VERY efficient grappling device by means of which reels of lead-covered cable can be quickly picked up and carried about by an overhead crane has effected a marked reduction in the labor of reel handling and has greatly reduced the space required for cable reel storage in the Hawthorne branch of the Western Electric Company. The grapples are used with cranes that are equipped with single drum hoist and traveling cages. The grapple is connected to the hoisting drum of the crane through a four-part wire hoist rope acting through two sheaves in the grapple block, which are so spaced as not to permit tipping. The frame of the grapple is attached to the block by means of a through-bolt fitted at the lower end with a ball-thrust bearing and worm gear to provide for rotation. Rotation is accomplished by means of a $\frac{1}{2}$-hp. motor and is connected to the worm gear through a spur and worm reduction.

The opening and closing motions of the grapple arms are obtained by means of a $\frac{3}{4}$-hp. motor and spur gear

Volts on Wheels





MAN-MADE lightning is no longer confined to the super-power laboratories, for engineers of the General Electric Company at Pittsfield, Mass., have just built a portable lightning generator, mounted on a truck trailer, which can be moved any place about the country where tests of 1,000,000 volts or artificial lighting may be wanted. All that is necessary is to elevate the ladder-like structure and connect the equipment to a 110-volt circuit. The main purpose of this new lightning machine is to make high-tension tests on transmission lines about the country. Each of the small condensers on the elevated ladder, which somewhat resemble a storage battery, produces 25,000 volts, the 40 providing the 1,000,000 volts.

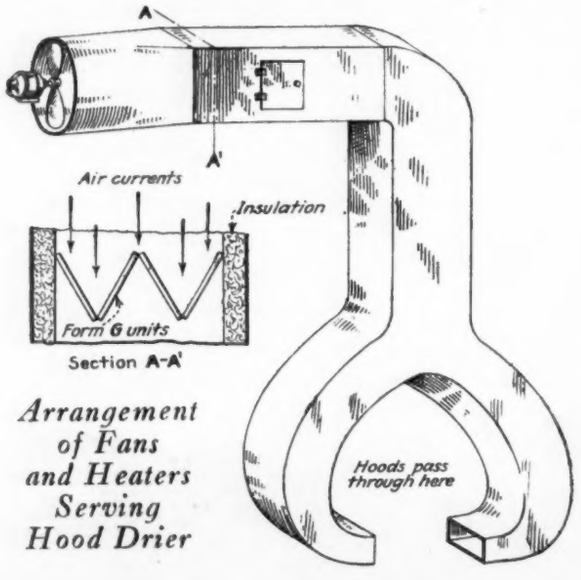
reduction and the right and left thread screws directly beneath the grapple frame. The screws impart the lateral motion to the grapple arms. All vertical and eccentric load is taken by the rolls attached to the top of the arms which run on the main frame of the grapple unit. The cylindrical drum at the extreme left end of the frame is a counter balance to provide for the horizontal alignment of the lifting pins shown at the bottom of the arms. This alignment is important in view of the small opening in the hubs of the cable reels.

Control of the two grapple motions is obtained through two reversing drum controllers located in a convenient position at the front of the traveling cage of the crane. Power is supplied to the grapple motors through two cables connected to the winding drums on the trolley of the crane. Grapples of the type here described have been used in the handling of reels of lead-covered cable for a period of three years and have given excellent results.

Hood Driers Arranged for Electric Heat

By A. M. Hill
General Electric Company, Atlanta, Ga.

IN A large automobile assembly plant which had been using a steam-heating unit on its hood-drying machine and had found it very unsatisfactory the following conditions were to be met: Approximately 2,900 cu.ft. of air per minute was to be heated from 70 deg. F. to a minimum of 130 deg. F. The general appearance of the duct work is shown in the accompanying sketch. The heater box, etc., were well insulated. To satisfy these conditions twelve form "G" heater units were specified.



Arrangement of Fans and Heaters Serving Hood Drier

These were to operate on 575 volts, and normally four units in series would require 440 volts. The twelve units gave a balanced load on the three-phase system.

Because the heaters were over-rated the control was interlocked with the control for the fan motor. A magnetic contactor was used, without interlock, having 575 volts on the three poles, and equipped with a 110-volt coil, energized from the motor circuit. This prevents accidental starting of the heaters without the fan.

How a Promotional Rate Built Business

Customers of Vermont utility respond to schedule offering lower unit energy prices. Company revenue grows

By Leon C. White
Manager Twin State Gas & Electric Company, Bennington, Vt.

THAT the so-called promotional rate will increase the sale of electricity was proved when this company adopted this form of rate in June, 1928. Previous to this time the residential rate in use was a two-part rate based on the customer's connected load, and, briefly, was 14 cents per kilowatt-hour for the first 25 hours' use of the connected load (not including appliances) and 7 cents per kilowatt-hour for the excess, with a 10 per cent discount for payment within ten days.

After a very careful study of about one-quarter of our customers' accounts, we decided that the rate adopted would result in a decrease in income, based on the same number of kilowatt-hour sales, of $6,300 for the ensuing year, but that while this was the theoretical loss, we expected that the increased sales would eliminate any loss. The results since making the change in rates have been more than gratifying and surely will be more so as time goes on.

Room Rate Adopted

Our present residential rate is a room rate and starts at 11 cents per kilowatt-hour for the first 4 kw.-hr. per room per month, drops to 6 cents per kilowatt-hour for the next 4 kw.-hr. per room per month, and for all over 8 kw.-hr. per room per month the rate is 3 cents per kilowatt-hour. A discount of 10 per cent is given for payment within ten days.

The commercial lighting rate was 14 cents per kilowatt-hour for the first 50 hours' use of the connected load and 7 cents per kilowatt-hour for the excess, with a 10 per cent discount for prompt payment. This was changed to a block rate as follows:

First	25 kw.-hr. per month	11 cents per kilowatt-hour
Next	75 kw.-hr. per month	10 cents per kilowatt-hour
Next	100 kw.-hr. per month	9 cents per kilowatt-hour
Next	500 kw.-hr. per month	6 cents per kilowatt-hour
All over	700 kw.-hr. per month	5 cents per kilowatt-hour

10 per cent discount for payment in ten days.
Minimum bill, $1.

A comparison of the lighting sales for the last six months of 1928 with the same months of 1927 indicates that our customers took advantage of the lower rates to make a greater use of our service.

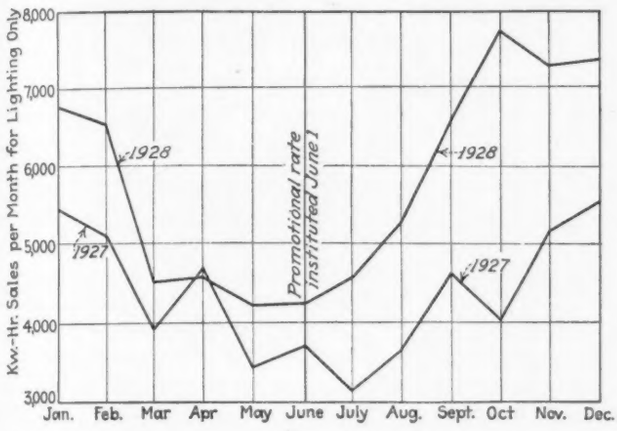
Comparing the same months in 1927 with 1926, it was found that the kilowatt-hour sales increased only

Table I—Six Months' Comparison

Sales for lighting, 1927, kw.-hr. 799,834, gross billing		$64,613.37
Sales for lighting, 1928, kw.-hr. 918,617, gross billing		$69,519.77
Increase, kw.-hr. 118,783		4,906.40
Per cent increase, 14.8		7.57
Average income per kilowatt-hour, cents	1927 8.1;	1928, 7.58
1928 kilowatt-hour times 1927 average cost per kilowatt-hour		74,417.97
1928 kilowatt-hour actual gross billing		69,519.77
Saving to customers		4,898.20
Per cent saving		7.04
Saving at same rate for twelve months		$9,796.40

7.4 per cent and the gross billing increased 4.15 per cent. This is just about half the increases obtained in 1928.

The 1928 income actually increased $4,906.40 for these six months, or at the rate of $9,812.80 for twelve months. As shown in the table, if we multiply the 1928 six months kilowatt-hour sales by the 1927 average rate per kilowatt-hour and deduct the actual 1928 income, we find that our customers saved $4,898.20, or for a



Response of About 200 Lighting Customers to Inducement Rate

twelve months period they saved $9,796.40. In our announcement of the rate change, we stated that the change in rates would save our customers $6,300 based on 1927 sales. We feel that our customers have received a real reduction and at the same time we have stimulated our business to such an extent that we actually gained in our income.

At the same time that we made the changes outlined above, we also changed the lighting rate in a nearby town where our rate was a straight-line rate of 16 cents with a 1 cent discount for prompt payment. This town was given a residential rate of 13 cents for the first 5 kw.-hr. per room per month, 9 cents per kilowatt-hour for the next 5 kw.-hr. per room per month and 4 cents for all over 10 kw.-hr. per room per month.

A commercial lighting block rate was placed in effect also. This rate is:

First	25 kw.-hr. per month	13 cents per kilowatt-hour
Next	75 kw.-hr. per month	11 cents per kilowatt-hour
Next	100 kw.-hr. per month	9 cents per kilowatt-hour
Next	500 kw.-hr. per month	6 cents per kilowatt-hour
All over	700 kw.-hr. per month	5 cents per kilowatt-hour

The kilowatt-hour sales and income from this town were included in the comparisons shown above, but it is very interesting to take this town by itself and see what happened when the new rates were substituted for the straight line 16-cent rate. The total number of customers in the town is close to 200.

The change was made June 1, 1928, and evidently no advantage was taken of the new rate during this month, but the increased sales in subsequent months were really astounding. The increase in kilowatt-hour sales for the year was 32.1 per cent and the income increased 7.8 per cent, notwithstanding the very real reduction from a flat 16-cent rate to one with a top step 3 cents lower and two still lower steps to care for the use of appliances. In making these changes we reduced a high top rate, we eliminated the need of

Table II—Increases in Consumption Resulting from Promotional Rate

	Lighting Only			
	1927 Kw.-Hr.	1928 Kw.-Hr.	Increase Kw.-Hr.	Per Cent
January	5,432	6,663	1,231	22.6
February	5,027	6,586	1,559	31
March	3,951	4,528	577	14.4
April	4,672	4,590	82*	1.7*
May	3,551	4,229	678	19
June	3,753	4,256	503	13.4
July	3,169	4,597	1,428	44.8
August	3,702	5,219	1,517	40.8
September	4,626	6,578	1,952	42.2
October	4,078	7,714	3,636	98.2
November	5,179	7,279	2,100	40.6
December	5,473	7,364	1,891	34.5
Total	52,613	69,603	16,990	Ave. 32.1
Income	$8,635.49	$9,325.11	$689.62	7.8

*Decrease.

inventorying the customers' connected load for use in making the base on the old 14-cent rate and we made a real gain in sales for the year.

We had some complaints that the new rates were higher than the old 14- and 7-cent rate, but in nearly all cases this was because the customer had had a connected load rating much below his actual wattage.

By serving our residential service through one meter, our customers will save considerable money when installing ranges or other heavy-duty apparatus and the form of the rate permits the economical use of appliances for every purpose.

Our merchandise salesmen report that sales are made much more easily now than formerly and our sales of small merchandise indicate that our customers are buying more of this class of goods than ever before.

The ordinary residence customer uses but from 30 to 40 kw.-hr. per month, and a company that is selling electricity by the regular form of block rates does not offer to its customers a rate at which the customer will make free use of the service. We believe that the company will find that the adoption of some form of so-called promotional rates will result in not only increasing its income but will also result in materially better public relations.

Research in Safety

By C. E. Skinner
Assistant Director of Engineering
Westinghouse Electric & Manufacturing Company

MODERN society demands that safety measures be devised which will mitigate or eliminate, if possible, the dangers which are brought about through our present industrial life. Many of these safety measures require research of a high quality in order that the cheapest and most efficient of them may be provided. This is true in every phase of our industrial life, and the electrical industry has perhaps gone further in its study and application of safety measures than almost any other, but there will be additional requirements with each application and each extension of the use of electricity.

Electric Shovels

Thin coal veins comparatively deeply imbedded are worked economically with electric power. Shallow deposits of Kansas and Missouri taken out in competition with local deep mines

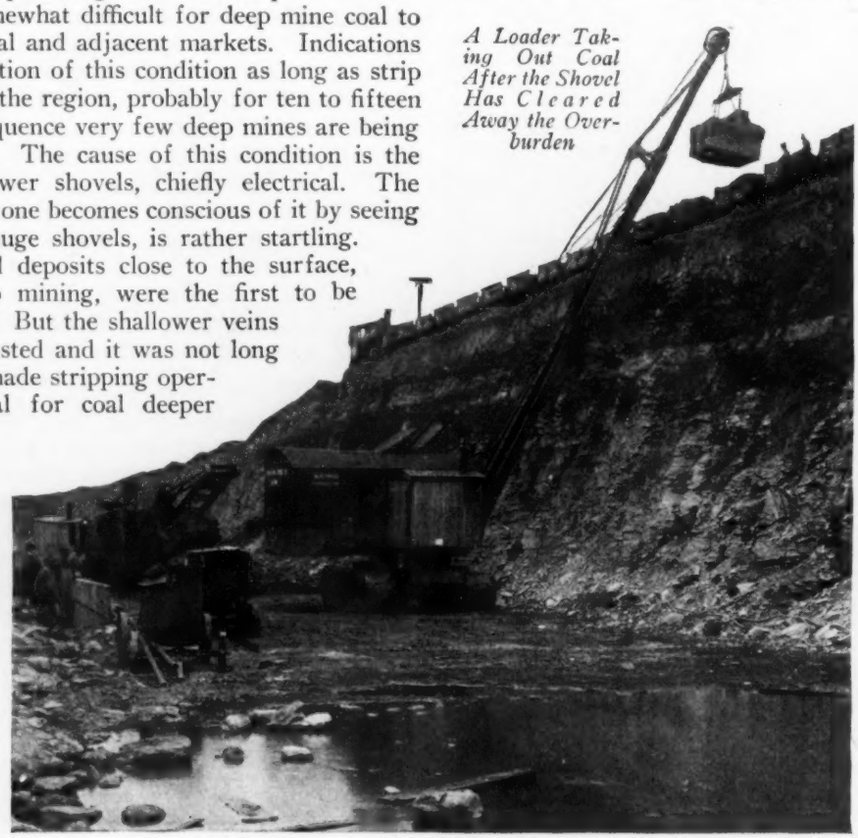
Five Members of Pittsburg-Midway Coal Company in Mouth of 16-Yd. Bucket

Harold Spencer, C. F. Spencer, president of the coal company; K. A. Spencer, engineer; George Nettles, superintendent, and Charles Williams

AN INCREASE in coal production of 350 per cent from strip mines in southeastern Kansas is the record from 1921 with 38 mines in operation to 1928 with 37. Strip mining has so developed in recent years that it is somewhat difficult for deep mine coal to compete on the local and adjacent markets. Indications point to a continuation of this condition as long as strip coal is available in the region, probably for ten to fifteen years. As a consequence very few deep mines are being opened in Kansas. The cause of this condition is the development in power shovels, chiefly electrical. The development, when one becomes conscious of it by seeing one of the latest huge shovels, is rather startling.

The shallow coal deposits close to the surface, which permit strip mining, were the first to be worked in Kansas. But the shallower veins were quickly exhausted and it was not long until deep mining made stripping operations uneconomical for coal deeper than 12 ft. with the laborious methods then available — pick and shovel or horse and scraper. Then came steam-operated shovels for removal of overburden from the coal. With this equipment it soon became evident that the strip mines would be highly competitive with the deep mines. The first steam shovels were equipped with dippers of about 1 cu.yd. capacity for handling dirt. The dipper capacity was gradually increased until 6 or 7 yd. were being handled at a time. When steam shovel equipment first came into use it was not often that more than 20 ft. of earth would be moved to get at the coal. Efficiency of equipment has so increased that 40 ft. of overburden is now removed for 30 in. of coal. The rule-of-thumb now is that a foot of overburden can be handled for each inch of coal available underneath.

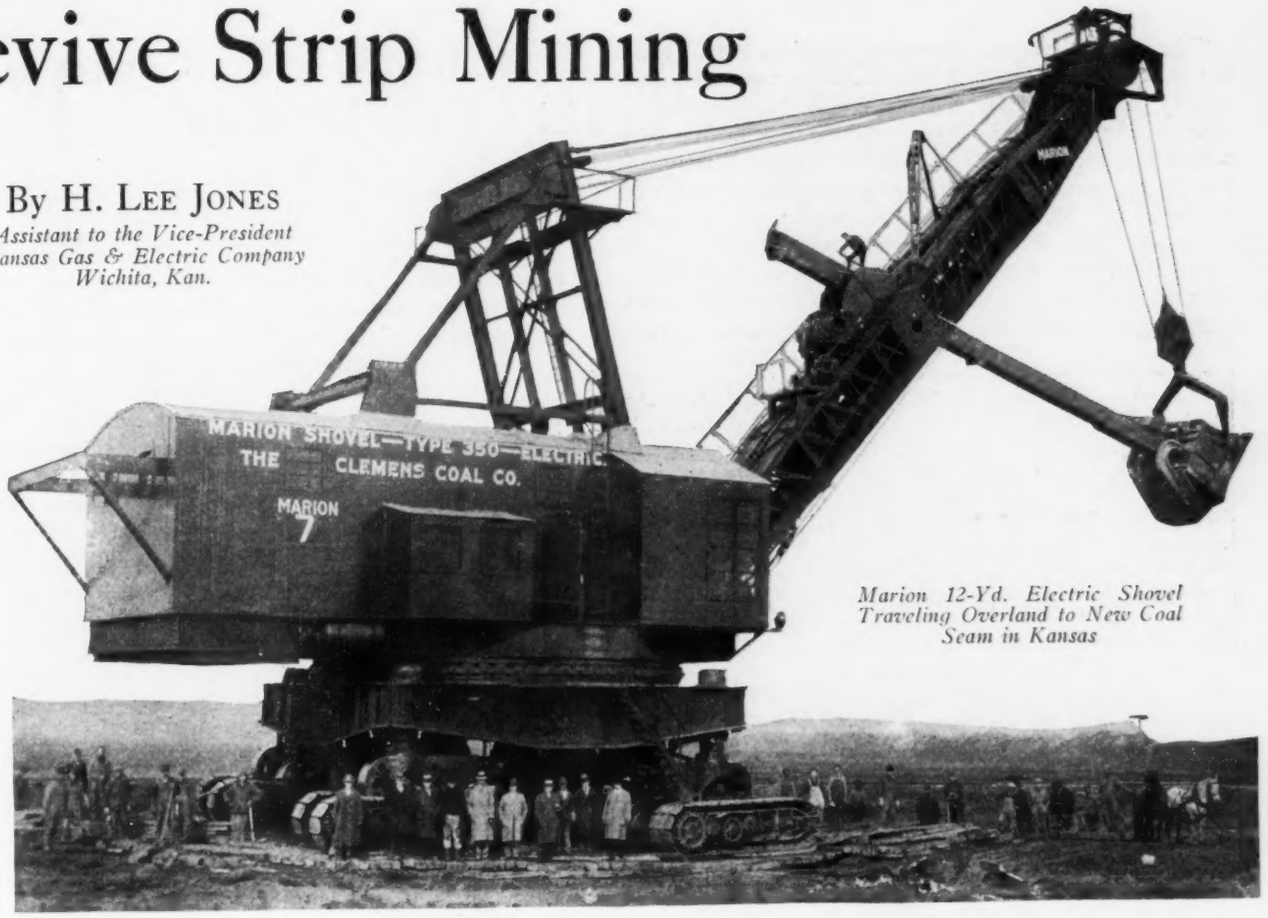
In 1918 the first electric shovel for strip mining was installed by the Pittsburg-Midway Coal Mining Company, just across the border line in Barton County, Missouri. This shovel was electrically equipped throughout with alternating-current motors, which were served through a 4,000-volt line feeding three 200-kva. transformers located in the rear end of the shovel. These transformers were used to step the voltage from 4,000 to 480 volts, at which voltage it was supplied direct to the motors. This machine had five motors — two 250-hp. motors on the hoist, one 125-hp. motor on the crowder, one 135-hp. motor for the swing and one 5-hp. motor for the small air compressor located on the machine. This equipment would move some 2,200 yd. of overburden per nine-hour shift. The voltage fluctuations were so severe as to necessitate the installation of an automatically controlled 450-kva. synchronous condenser near the



A Loader Taking Out Coal After the Shovel Has Cleared Away the Overburden

Revive Strip Mining

By H. Lee Jones
Assistant to the Vice-President
Kansas Gas & Electric Company
Wichita, Kan.

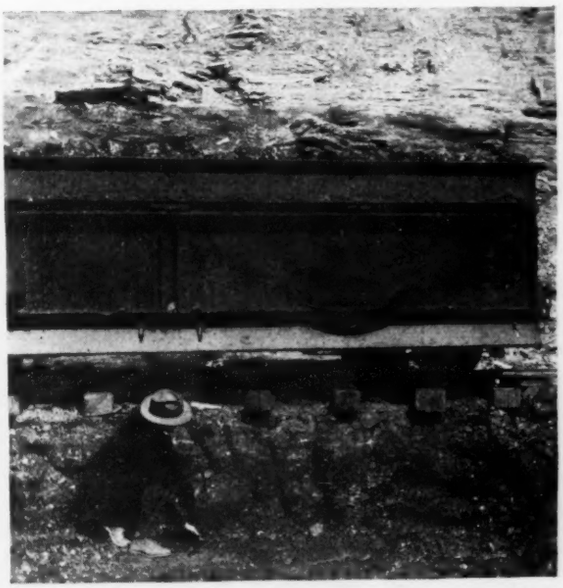


Marion 12-Yd. Electric Shovel Traveling Overland to New Coal Seam in Kansas

shovel for the correction of the poor power factor of the alternating-current equipment.

In 1927 the same company purchased the first large synchronous motor-generator-set-operated shovel to be installed in that field. Equipped with a 435-kva., 4,000-volt motor-generator mounted in the rear of the shovel, electric service was supplied through a 4,000-volt flexible cable 1,000 ft. long. The 4,000-volt synchronous motor drives three direct-current generators which are direct connected to the shaft of the motor. Two of these direct-current generators are on one side of the motor and one generator and the exciter are on the opposite side. These direct-current generators are used to drive motors operating separate parts of the equipment. One is used for the hoist motors, one for the crowder motor and one for the swing motor. By using separate direct-current generators with Ward Leonard control a highly flexible control of the shovel operation is obtained.

Just recently the Pittsburg-Midway company completed installation of the largest coal stripping electric shovel in the world. This giant has a total weight of 1,036 tons and required 28 railroad flat cars to transport it from the factory to the site of the erection. An idea of the size of the shovel is had from the illustrations (see page 266). It has an 85-ft. boom and 58-ft. dipper sticks. The bucket has 16-cu.yd. water measurement capacity and will handle on the average 18 yd. per cycle. It is equipped with an 800-kva., three-phase, 4,000-volt synchronous motor-generator set.

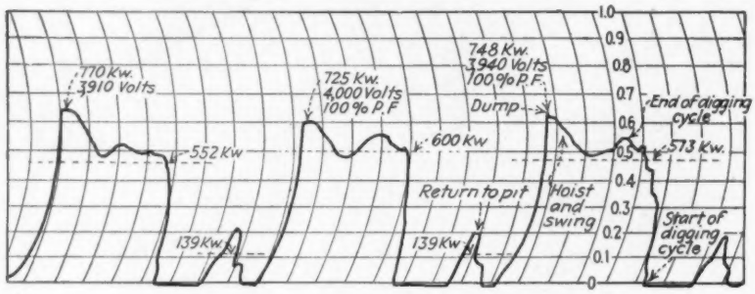


Between the Man's Hands Is the Seam of Coal for Which 20 or 30 Ft. of Earth Is Removed

Four hundred thousand cubic yards of earth per month can be moved by this shovel. The point sheaves on the end of the boom are 9 ft. in diameter and use 4½-in. cables for hoisting the bucket through the dirt. The dipper alone weighs 26 tons. Among the accessory equipment on this shovel, not found on previous types, are the two swing motors for acceleration, cycle recorders showing the actual number of dippers of earth handled, auxiliary hoists for threading the cable when necessary to make replacements and a Klaxon signal system for different control operations between operator and ground man. This shovel will operate on a 36-in. vein of coal with a 25-ft. overburden.

The shovel has no power other than that received through the 4,000-volt cable, which is connected to the supply lines of the Kansas Gas & Electric Company. In removing in excess of 10,000 cu.yd. of overburden during a nine-hour shift the shovel will use approximately 3,000 kw.-hr., or about 300 watts per cubic yard of dirt which has to be moved.

The graphic wattmeter record reproduced here was taken from a test made on a Marion 350 shovel operating in a mine of the Clemens Coal Company. This was the first large shovel in the field to be equipped with crawler



Graphic Wattmeter Record of 12-Yd. Shovel Operation

trucks. This shovel has handled more than 8,819 cu.yd. of overburden in one eight-hour shift. At present the shovel is moving approximately 30 ft. thickness of overburden for 30 in. of coal. The motive power of this shovel is a 435-kva., 4,000-volt synchronous motor driving three direct-current generators all on the same shaft.

This shovel has a 12-yd. bucket, 54-ft. dipper handle, 85-ft. boom and it will remove overburden up to 40 ft. The shovel complete with ballast weighs 700 tons. There were 22 carloads in the shipment of this shovel from the factory. This did not include the boom, which was manufactured in Pittsburg, Kan., by the Pittsburg Boiler & Machinery Company. The test on this shovel while operating under regular working conditions resulted in the data shown in the table below. The kilowatt-hour output shown below the zero line on the chart is due to regenerative braking used by this equipment.

Electric shovel equipment has had a most remarkable influence in the development of strip mining. Coal production in the strip mines of Kansas has shown a gradual increase from 1921 to 1928, although the total coal production in the state is gradually decreasing.

Strip mining production has advanced from 9.2 per cent of the total in 1921 to 32 per cent of the total production of 1928. The combined production of deep mine and strip operations in 1921 was 4,028,624 tons, of which 371,123 tons was produced by the latter method. In 1926 the total coal production was 4,562,955 tons. Of this amount 27 per cent was produced by strip mining.

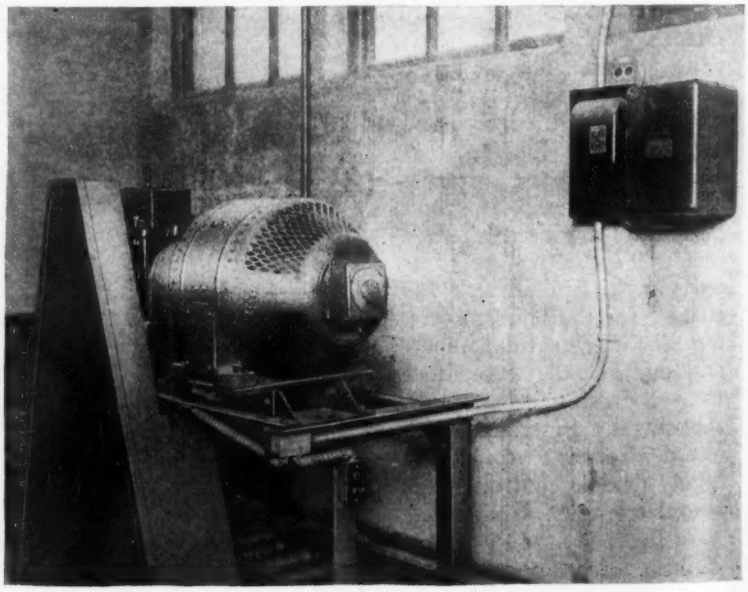
Average kilowatt-hours per cycle (input).....	3.71
Average kilowatt-hours per cycle (output)....	0.44
Average net kilowatt-hours (input).....	3.27
Average yards of material per cycle.....	9.6
Net kilowatt-hours per yard material 3.27/9.6..	0.34
Fifteen-minute demand kilowatt is average kilowatt-hours per cycle / average hours per cycle 3.27/0.0117	280

Motor-Driven Conveyor Installation

By H. H. Watson
Industrial Control Engineering Department, General Electric Company

A LARGE number of different operations and processes are required for the fabrication and assembly of industrial control devices. This means that any factory devoted to the manufacture of such devices must necessarily provide facilities for transporting a large amount of material. In the Schenectady plant of the General Electric Company in one of the buildings devoted to the manufacture of industrial control an extensive motor-driven conveyor system has been installed. In the accompanying illustration is shown one of the motors with its control. Such stations are located at various points along the conveyor system. Each floor of the building is encircled by a conveyor and the various floors are interconnected by means of an elevator which is fed by the conveyors. The electrical equipment seen in the installation is a 7½-hp. 1,150-r.p.m., 230-volt, shunt-wound, direct-current motor controlled by a magnetic controller having time acceleration. The starting and stopping operations are controlled from a push-button station which is mounted on the framework supporting the motor. The motor can be started only from this central location, but there are a number of "stop" push-button stations located at convenient intervals along the conveyor so that it may be stopped from any of a number of points.

As shown in the illustration the electrical equipment for this conveyor system makes use of practically no space which would be of any value as floor space. The controller is mounted on the wall and the motor is located above the conveyor in such a manner that it requires no more floor space than does any other section of the conveyor.



A Typical Motor Station on a Conveyor System

The push-button control is located at the motor, but stop push buttons are located at convenient intervals along the conveyor.

Tests on Paper Cables

Observation of an experienced utility engineer in cable factories. Discussions of tests and testing methods. Test results as obtained show variables

By RAYMOND D. SHERMAN

Equipment Engineer Byllesby Engineering & Management Corporation

MUCH has been said and written about the way paper cable should be made up, about the method of applying the paper and impregnation thereafter with the various compounds, about the use of rosin and other ingredients in these compounds, about the effects of ionization on the life of the cable and about the various technical and other aspects of the manufacture of paper cables.

All of this work has been good and for a good purpose, but the old saying that "the proof of the pudding is the eating thereof," so, with paper cable, we should also study the effects of these various theories on the cables after they are manufactured.

Various authorities are divided on the basis of comparison to be used in judging the good and bad qualities of paper cables. Some authorities have developed certain evaluation schemes which they use as such a basis. However, any such basis must be developed more or less empirically on the "cut-and-try" methods. That is to say, certain features of the make-up, or certain tests, must be given weights and the cable then evaluated. The cable which gives the highest rating must then be closely watched in service to see that it lives up to its reputation, so to speak. If it is found that cable given a high rating under this evaluation scheme fails very soon in service, there is something wrong with the method of evaluation and a new basis must be sought.

During the year 1928 it was my privilege to inspect and test paper cables in nearly all the large cable factories in the East. In the comparative tables given in this article only one basis of comparison is used, the break-down voltage per mil of paper thickness during the so-called "hot" and "cold" tests. These tests were conducted in accordance with the specifications of the Associated Edison Illuminating Companies, revision of September, 1926.

For the benefit of those who are interested and who may not be familiar with the methods of making these tests a brief description is given here.

"HOT" BREAK-DOWN VOLTAGE TEST

The "hot" tests were made as follows:

Samples of the desired length were added by the purchaser to the regular cutting lengths sent in to the manufacturer. The manufacturer was, of course, not aware which cable length had the test length added. This test length was selected by the representative of the purchaser during the progress of the routine tests. Later it was cut off and set aside. One such length was designated for each 15,000 ft. of cable or less. The length cut off varied with the different factories, but there was always at least 10 ft. of cable left under the load. The variations in total length were due to the different lengths for test ends desired by different manufacturers. The lengths also varied with the different operating voltages for which the cable was designed, as this test was required on cable of all voltages.

Samples selected for this test were brought to the required temperature and kept there for at least two hours. This temperature was usually 85 deg. C. On cables rated at the higher operating voltages the temperature might be less or at the maximum safe operating temperature. The sample was kept at the required temperature for two hours in order that all parts of the cable might reach the same temperature. The cable was kept at this temperature, or as near it as possible, all the time during the process of the break-down test.

Various methods were used to bring the cable up to the required temperature and to maintain it there. One of the simplest and best was the oil bath, heated by steam coils and regulated by thermostats. Another method was a high-current, low-voltage series transformer connected directly to the lead sheath. Temperature of the cable was regulated by varying the current in the series transformer. Still another method, and a much cruder one, which could only be used on low-voltage samples, was to heat the cables in an oven. In some cases the sample had to be removed from the oven for the break-down

Table I—Summary of Dielectric Strength Tests in One Factory

FACTORY A

Kind of Cable Size and Insulation	Paper, In.	Cable Rating, Kv.	Break-down Tests (Volts per Mil) Break-down Hot Test	Cold Test
One-conductor, 250,000 circ.mil.....	6/64	1	958	1,025
				428
One-conductor, 500,000 circ.mil.....	6/64	1	725	639
			725	748
One-conductor, No. 5.....	13/64	4	...	406
Three-conductor, 350,000 circ.mil...	19x12	33	...	404*
	64	Average..	802	608

*Evaluated value, volts per mil per hour. This factory was unable to prepare the ends so that the conductors would not flash over and it was necessary to introduce the time element in order to breakdown the cable. Included in average.

Average, cable rated above 7.5 kv.....	404
Average, cable rated below 7.5 kv.....	706
General average, nine samples, volts per mil.....	673

Tables II to VIII—Hot and Cold Dielectric Break-down Values of Cables in Seven Other Factories

Samples were bent 180 deg. around forms having twelve times the outside diameter of the cable and then straightened and bent in the opposite direction. This cycle of bending was repeated before the break-down test was conducted.

FACTORY B

Kind of Cable Size and Insulation	Paper, In.	Cable Rating, Kv.	Break-down Tests Break-down Hot Test	Break-down Tests (Volts per Mil) Cold Test
Three-conductor, 350,000 circ.mil...	19x12	33	...	535
	64			440
Three-conductor, 250,000 circ.mil...	22/64 (CS)	33	450	464
				532
One-conductor, 1,500,000 circ. mil...	16/60	5	487	400
Three-conductor, one-conductor...	19x12	33	...	465
	64			
One-conductor, 350,000 circ. mil....	24/64	33	525	540
				542
		Average..	487	489

Average, cable rated above 7.5 kv..... 499
Average, cable rated below 7.5 kv..... 443
General average eleven samples, volts per mil..... 489

FACTORY C

Kind of Cable Size and Insulation	Paper, In.	Cable Rating, Kv.	Break-down Tests Break-down Hot Test	Break-down Tests (Volts per Mil) Cold Test
Four-conductor, 350,000 circ.mil....	8 x 5	4	...	600
	64			600
Four-conductor, No. 8.....	10x4	10	...	410
	64			
Three-conductor, 500,000 circ.mil...	10x8	15	394	435
	64	Average..	394	511

Average, cable rated above 7.5 kv..... 414
Average, cable rated below 7.5. kv..... 600
General average five samples, volts per mil..... 488

FACTORY D

Kind of Cable Size and Insulation	Paper, In.	Cable Rating, Kv.	Break-down Tests Break-down Hot Test	Break-down Tests (Volts per Mil) Cold Test
	19x12			
Three-conductor, No. 1/0.....	64	33	...	405
One-conductor, 46.....	14/64	10	412	376
			365	472
Three-conductor, 250,000 circ.mil...	19x12	33	510	352
	64			
One-conductor, No. 3.....	16/64	15	...	540
Three-conductor, No. 6.....	14/64	10	400	...
		Average..	422	429

Average, cable rated above 7.5 kv..... 426
Average, cable rated below 7.5 kv..... 0
General average nine samples, volts per mil..... 426

FACTORY E

Kind of Cable Size and Insulation	Paper, In.	Cable Rating, Kv.	Break-down Tests Break-down Hot Test	Break-down Tests (Volts per Mil) Cold Test
Three-conductor, 500,000 circ.mil...	19x12	33	394	296*
	64			352
				425
Three-conductor, 500,000 circ.mil...	24/64 (H)	33	...	400
				492
		Average..	394	417

*Evaluated value. Volts per mil per hour. This factory was unable to prepare the ends so that the conductors would not flash over and it was necessary to introduce the time element in order to break down the cable. Not included in average.

Average, cable rated above 7.5 kv..... 414
Average, cable rated below 7.5 kv..... 0
General average five samples, volts per mil..... 414

FACTORY F

Kind of Cable Size and Insulation	Paper, In.	Cable Rating, Kv.	Break-down Tests Break-down Hot Test	Break-down Tests (Volts per Mil) Cold Test
Three-conductor, 500,000 circ.mil..	10x8	15	277	465
	64		398	530
		Average..	337	497

Average, cable rated over 7.5 kv..... 417
Average, cable rated below 7.5 kv..... 0
General average four samples, volts per mil..... 417

FACTORY G

Kind of Cable Size and Insulation	Paper, In.	Cable Rating, Kv.	Break-down Tests Break-down Hot Test	Break-down Tests (Volts per Mil) Cold Test
One-conductor, 250,000 circ.mil.....	6/64	1	...	550
				536
		Average.....		543

Average, cable rated above 7.5 kv..... 0
Average, cable rated below 7.5 kv..... 543
General average two samples, volts per mil..... 543

FACTORY H

Kind of Cable Size and Insulation	Paper, In.	Rating, Kv.	Break-down Hot Test	(Volts per Mil) Cold Test
Three-conductor, 350,000 circ.mil...	19x12	33	...	352*
	64			406*
Three-conductor, 500,000 circ.mil...	10x 8	15	...	470*
	64			474
				474
				413
				413
				421
Three-conductor, No. 4/0.....	10x 8	15	...	485
	64			485
Four-conductor 350,000 circ.mil....	8 x 5	4	...	380
	64			372
Four-conductor, No. 3.....	8 x 5	4	...	436
	64			
Three-conductor, 350,000 circ.mil...	8 x 5	4	...	429
	64			
Three-conductor, 500,000 circ.mil...	8 x 5	4	...	380
	64			
One-conductor, 250,000 circ.mil.....	6/64	1	...	310
				341
				241
				182
One-conductor, 500,000 circ.mil.....	6/64	1	...	203
				183

*End flashovers.

Average, cable rated above 7.5 kv..... 439
Average, cable rated below 7.5 kv..... 314
General average 21 samples, volts per mil..... 373

Table IX—Summary of Eight Factory Tests

	Average Break-downs Below 7.5 Kv.		Above 7.5 Kv.		General Average
Manufacturer	No. Samples	V.p.M.	No. Samples	V.p.M.	Volts per Mil
Factory A.....	8	706	1	404	673
Factory B.....	2	443	9	499	489
Factory C.....	2	600	3	414	488
Factory D.....	0	0	9	426	426
Factory E.....	0	0	4	417	417
Factory F.....	0	0	6	414	414
Factory G.....	2	543	0	0	543
Factory H.....	10	314	11	439	373

General average—459
(All factories weighted)

test and this cooled off considerably before completion of the test.

The test voltage at the start of the break-down test was 180 per cent of the routine test voltage, or, in other words, where the routine test voltage was 165 volts per mil the first break-down test voltage was 297 volts per mil. The source of the test voltage might be either three-phase or single-phase voltage. If three-phase voltage was used one test only was necessary on three-conductor cable. If single-phase voltage was used two tests were necessary on three-conductor cable in order that all phases might be stressed alike. Usually when three-phase voltage was used the neutral of the transformer and the sheath of the cable were grounded, giving Y voltage to the sheath. In using single-phase voltage the midpoint of the transformer or the midpoint of two transformers might be grounded, giving half voltage to sheath.

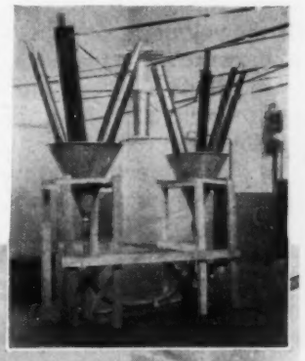
The first test at 297 volts per mil was called the "acceptance" test, and where used all samples were required and did pass this test before the cable was accepted. After this test was completed the samples were tested to failure as follows:

Starting at the voltage at which the acceptance test was made, the voltage was raised in steps of approximately 15 per cent of the preceding test voltage until failure occurred. The voltage was maintained constant for five minutes at each step. Where a single-phase test voltage was used it was necessary to shut down after each second step in order to change connections.

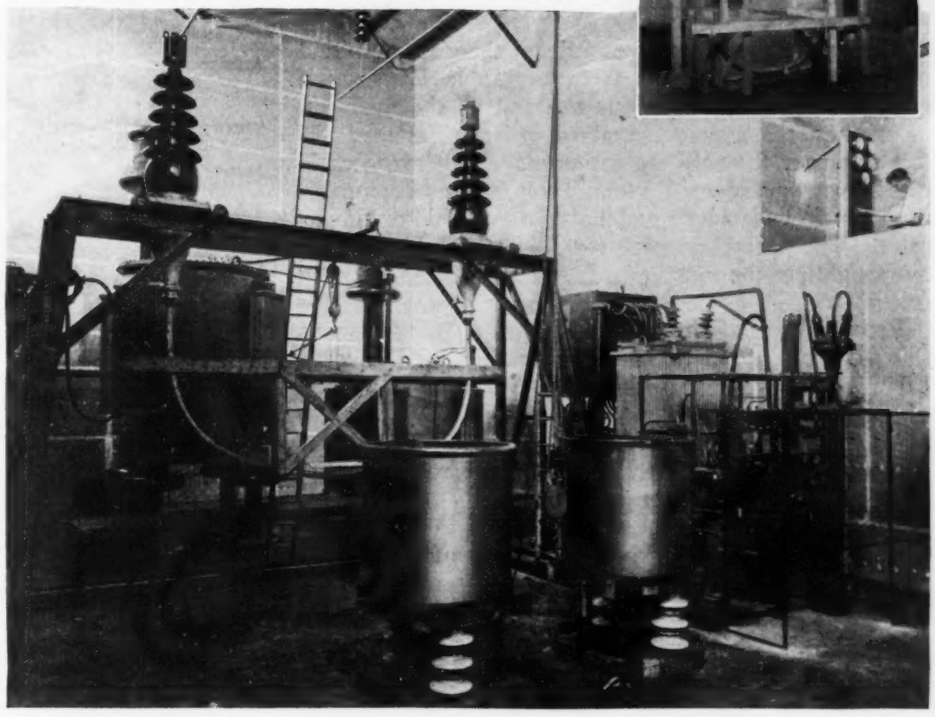
This so-called "hot" test was left out of the September, 1928, revision of the A.E.I.C. specifications and was abandoned by us in the middle of the year. This explains why there are not so many results from "hot" tests tabulated.

The selections of the samples were made in pretty much the same way as for the preceding test. After being designated, samples were cut off and the ends were sealed with lead until ready for test. The samples were immersed in melting ice or otherwise maintained at a temperature of minus 10 deg. C., until all the parts of the cable were at the required temperature. Most companies use chopped ice and rock salt as the medium to obtain this temperature, but one factory had a different scheme. An old electric refrigerator unit was rigged up to a double pipe arrangement so that it was not bothered with ice troubles. And these ice troubles are real. In one instance the sample of cable was supposed to have been placed in the ice at 7:30 in the morning so that it would be ready to bend at a later hour in the forenoon. Due to other tests being in progress and other delays, no time was found before the lunch period came to bend the cable and it was decided to leave it on the ice until after lunch. The place where the sample was immersed was some distance from the regular test, so no examination of the sample was made until the men went up to bend the sample. It was then found that the sample had not been on the ice at all. The iceman had forgotten to deliver the ice and the workman whose job it was to place the sample on the ice had not reported that fact, so the sample was not bent that day. This is more or less of a digression and we will return to the "cold-bend" test.

The usual length of time required to cool the sample to the designated temperatures was two hours or more, depending on circumstances. The sample was then removed from the ice, the end seals knocked off and the bending test made. A cylindrical form having a diameter equal to approximately twelve times the outside diameter of the cable was used. The sample was bent 180 deg.



Single- and Three-Conductor Cable Undergoing Cold-Bend Break-down Test



around this form, first in one direction, then in the other, straightening it up each time before bending it in the opposite direction until this cycle of operation had been performed twice. This made a total of four bending operations. The cable was held at all times so that it could not be revolved on its own axis. The equipment used in making these bends varied with the factory where made. One factory used an up-ended cable reel with another reel head of the required diameter on top of it. The cable was bent around this reel head and then straightened by main force, or man-power, before being bent in the opposite direction. Another factory had a table nicely grooved and fitted with various sized forms so that any size cable could be placed on the table, clamped in the forms and bent readily, with no chance of the cable rolling. With this method it was always cer-

tain that the cable was bent in the middle. Between these two extremes various other methods were used.

After the sample had been bent the fourth time and while still bent it was tested to failure. The preparation of the sample for test required considerable time, so that the break-down test was made at room temperature. The "acceptance" test voltage was 90 per cent of the "hot" test voltage, or, as before designated, at 268 volts per mil. It was necessary for the samples to pass this test before the lot of cable represented by the samples could be accepted. After the completion of this test the cable was tested to failure in the same manner and using the same methods as described in the "hot" tests.

The frequency of the test voltage in all cases was 60 cycles. The method of measuring the voltage varied with the factory. In all cases, where necessary, the calibration of the voltmeter was checked with sphere gaps connected to measure the actual voltage on the sample.

In tabulating results obtained the attempt was made not to go into too much detail, but to give enough information for a comprehensive understanding of the results. For obvious reasons no manufacturers are mentioned by name, but their factories are designated by a letter.

Results of Tests

The first eight tables give in detail the class and kind of cable covered in each factory. Table IX gives a general summary of the tests made at all the factories, using only the average obtained at each factory. In this summary the only separation made is between cable rated below and above 7.5 kv. Table X shows comparative data from factories making the same kind or similar cable. The general average for all factories is obtained by weighting the number of samples tested at each factory.

Practically all of the cable included in these tests was shipped to one of our Pittsburgh properties, the Duquesne Light Company. A very little of it was shipped to one of our Western properties.

An examination of the tabulated results shows that Factory A obtains its leading standing from the preponderance of low-voltage cable tested.

The figures showing the results of tests in one factory were forwarded to me by another member of our organization.

Conclusions

To sum up my observations, I would say that it is my personal opinion that the paper cable manufactured during 1928 was somewhat inferior in quality to the cable turned out in the preceding years. This statement is based on results obtained during physical examinations of dozens of samples. These examinations disclose the mechanics of the make-up of the cable to be deficient in various ways; wrinkled papers; insufficient and misplaced fillers; lead sheath wrinkled and out of center; indifferent saturation, and ridged conductors were among the defects noted. The above conditions were not confined to any one factory, nor were all the defects noted found in any one factory. Many of the defects noted were not serious enough to cause rejection under the specifications, but they indicated a certain amount of inattention to details.

You might liken the cable industry to a man on a new job. At first he is trying hard to make good and gives his best attention to all details; after a year or two he thinks he has the job "licked" and allows certain little details to slide, thinking that if, in the main, his work is done right his job is safe. My experience with the manufacturers of paper cables extends back to 1923 and there was a steady improvement in the quality of the high-voltage cable made up to 1926. Like the illustration above during that period, the cable industry was, more or less, on its toes, so to speak, to turn out good cable—cable that would stand the increasing voltages asked for. Having accomplished that feat, it rested on its laurels and the workman became more or less slack or indifferent, knowing that the cable would pass the acceptance tests in the factory anyway.

Thc above observations have been made in various factories and members of their management forces have taken issue with me. There are men who are responsible for the quality of cable turned out by their factories who will argue that wrinkled papers do not necessarily mean poor cable. Nevertheless, in many of the break-down failures examined the failure occurred at the point where the paper was wrinkled or the conductor ridged. In fact, every failure examined which occurred during the routine voltage test was found to be caused by wrinkled papers or paper folded back on itself.

In one instance a single-conductor 33-kv. cable failed during the routine voltage test at 75 kv. An examination of the failure revealed that it came where the paper was doubled back on itself. This cable was remade and failed again on a second routine test. An examination of this failure disclosed poor workmanship that was entirely inexcusable. During the process of insulating

Table X—Comparative Averages, Year 1928

All Readings Are Volts per Mil

Three-Conductor, 33-Kv. Belted Cable

	1/0	250 M.	350 M.	500 M.	Average
Factory A	...	...	404	...	404
Factory B	465	...	487	...	476
Factory D	405	352	...	...	378
Factory F	...	...	...	373	373
Factory H	...	...	379	...	379
Average	420	352	423	373	

Grand average 392
Operating gradient 37

Three-Conductor, 15-Kv. Belted Cable

	4/0	500 M.	Average
Factory H	485	444	464
Factory C	...	435	435
Factory E	...	497	497
Average	485	459	

Grand average 472
Operating gradient 37

Three and Four-Conductor, 4-Kv. Belted Cable

	4C-No. 3	4C-350 M.	3C-350 M.	3C-500 M.	Average
Factory H	404	380	429	380	395
Factory C	...	450	...	...	450
Average	404	415	429	380	

Grand average 407
Operating gradient 16

One-Conductor and Type H 33-Kv. Cable

	H-250 M.	H-500 M.	1C-350 M.	Average
Factory B	498	...	541	520
Factory F	495	446	...	470
Average	496	446	541	

Grand average 494
Operating gradient ..... 37 for H-250 M.
Operating gradient ..... 34 for H-500 M. and 1C-350 M.

One-Conductor, 1-Kv. Cable

	250 M.	500 M.	Average
Factory A	716	693	704
Factory H	268	193	230
Average	492	443	

Grand average 467
Operating gradient 1

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the cable the roll of paper had run out and the workmen on the paper machine had attempted to repair it by hand, rolling the papers on and tying them with cord. This was about midway in the process of insulation. The test had proceeded for about ten of the required fifteen minutes' duration when the cable "let go." It broke through the good paper next the conductor, then followed longitudinally along the repair for about 6 in., when it broke through to the sheath. The good paper next to the conductor was strong enough to hold the voltage for a while, but the ionization of the air in the space where the cable was repaired finally broke it down. The action of the voltage in this case was very evident. However, one wonders how many times minor repairs of this nature are made during manufacture. Perhaps a better job was done so that the cable was good enough to withstand routine voltage test, accepted and shipped to the job. There it was installed and after a period of service failed. In failing, it might destroy all evidence of this repair. It then goes down on the records as having failed from some unknown cause. In all probability no factory management would knowingly condone this sort of workmanship, but careless workmen might possibly get away with this kind of work.

Use of Electric Ranges Increasing

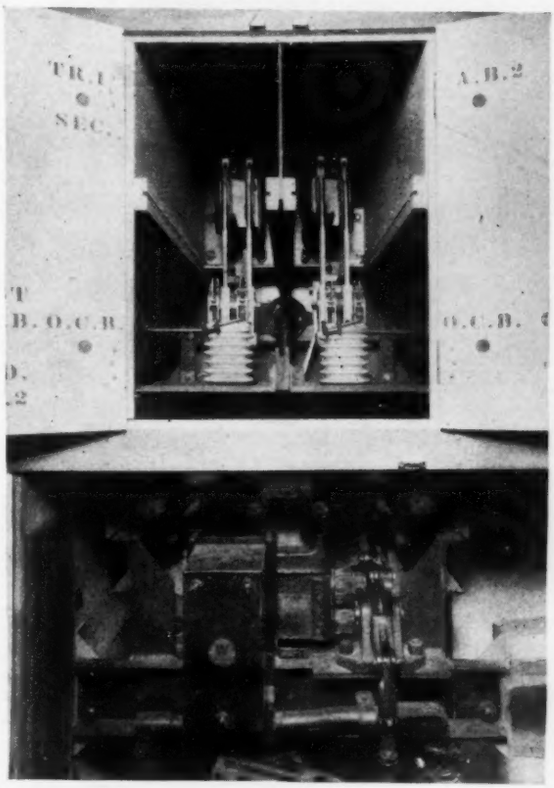
REPORTS from ten electric companies at scattered locations throughout the country give very interesting data on electric ranges and their use. On January 1, 1927, the average number of domestic customers on these companies' lines using electric ranges was 4.23 per cent, which figure was increased until on January 1, 1928, it reached 6.18 per cent, reaching 7.8 per cent on January 1, 1929. One company has 32.7 per cent of its domestic customers using ranges, while the lowest was 0.75 per cent. The latter company is located in a natural gas district.

In general, sales departments strive to put their sales on a paying, or at least on a self-supporting, basis. In one instance they were satisfied to sell ranges at a loss, figuring on the increased power sales to make up the deficit.

The rates charged ran from 2.6 to 4.2 cents per kilowatt-hour, with the average of the companies at 3.3 cents. From 1,112 to 1,700 kw.-hr. per year was given as their power consumption. An average of the companies showed this to be 1,527 kw.-hr. per year, which at average rates should be $50.39 per annum ($4.20 per month).

Installation charges varied more than any other figures, ranging from $19.57 to $75. In two cases this charge is added to the price of the range, while in other instances the buyer has to make the installation.

Compact Switch Installation



THE combination of disconnecting switches and circuit breakers in single structural units characterizes the 12-kv. installation in the new Washington Park substation of the Commonwealth Edison Company. This picture shows the in and out disconnects mounted on the top of one phase of a 3,000-amp. transformer breaker. Hanging at the left of the breaker mechanism is an ebony asbestos board which is inserted in grooves at the sides of the cubicle to close off the line top clips of the disconnecting switches when work is being done below.

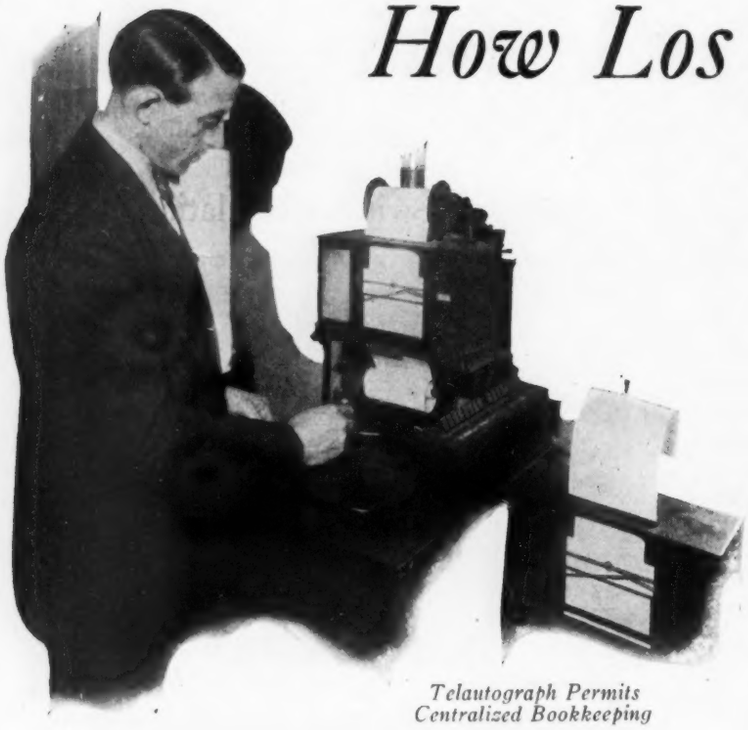
Data on Some Power Companies Interested in Electric Range Sales

Company	Kinds of Ranges	Domestic Customers	Ranges on Lines Jan. 1, 1928	Number Sold		Installation Cost, Dollars	Installation How Charged	Average Consumption per Year Kw.-Hr.	Rate Type	Rate Average per Kw.-Hr. Cents	Average Annual Bill, Dollars	Range Customers' Consumption (Annual) Kw.-Hr.	Total Revenue, Dollars
				1927	1928								
1	A & B	312,267	11,941	Co. 2,364	3,841	35–55	Customer	3,606*	Lighting, heating and cooking	2.6	93.85*	39,113,530*	1,018,251.08*
				Dealer 627	1,272								
2	A	262,000	12,000	2,081	1,588	30–50	Customer	1,500	Room rate	3–4	52.50	18,000,000 (est.)	630,000.00
3	A & C	168,011	5,000 (est.)	677	522	50–75	Customer 12 mo. 6% opt. plan	1,200 (est.)	No special	3.25	39.00 (est.)	.....	.....
4	A & B	101,045	600	294	166	35–50	Customer	1,600–1,800	3 step rate to 3c.	3.75	.....	.....	.....
5	A & B	77,787	11,470	1,982	1,799	35	Customer	1,291	One meter combination	2.99	.....	13,745,000	390,275.00
6	A	74,848	8,384	1,972	3,372	25	Customer	1,600	4, 3½, 3	....	60.00	.....	.....
7	A, B & D	65,294	4,670	1,367	2,017	30–40	Added to price	2,200	$3 demand plus 3 and 1½	3.7	81.00	9,134,443	372,242.00
8	A & B	37,668	9,223	1,124	1,166	32.50	Customer	1,512	Block	3	43.36	13,945,176	418,355.28
9	A	26,563	1,946	1,024	1,166	19.57	Added to price	1,112	Various	4.2	46.70	1,700,783	70,898.52
10	A & B	25,196	5,774	1,454	2,235	35.00	Customer	1,632	.....	.....	42.72	8,903,985	232,244.84

*Consumption, bill and revenue include lighting and heating.

How Los Angeles Utility

By S. K. DECKER
Assistant Comptroller
Department of Water and Power
City of Los Angeles, Calif.



Telautograph Permits Centralized Bookkeeping

While engineers have constantly improved apparatus and increased efficiency in the operating branch of the public utility business, the accountant has struggled along with old and inefficient methods, perhaps due to lack of mechanical methods specifically designed to meet the needs of customers' accounting and billing.

In the accompanying article S. K. Decker, assistant comptroller Department of Water and Power of the city of Los Angeles, tells how the department has greatly increased billing efficiency and reduced errors and customers' complaints to a minimum. Constant striving to improve billing methods since 1924 has culminated in the system here described.

A punched card ledger system forms the basis of the plan and by the use of a specially designed automatic feeding and ejecting attachment for a printing tabulator, billing costs, clerical staff, errors, delinquent accounts, bad debts and outstanding accounts have been greatly reduced.

CONFRONTED with constantly mounting and excessive costs of bookkeeping and with a steady flow of complaints, the Department of Water and Power of the city of Los Angeles in 1924 came to the realization that its commercial procedure was neither efficient nor economical. Investigation indicated that methods employed by practically all large public utilities were inefficient because equipment available had not been specially designed to render and keep utility consumers' accounts. Complaints and errors arising from many causes were greatly in excess of what a well-functioning organization should have.

Mechanical devices in use, although standard, were inefficient. Duplicate operations were performed with an accumulation of errors and expense. Looseleaf ledgers were in use which resulted in overlooked accounts and many discrepancies between billing and posting. Experiments were made with all kinds of devices with a view to designing the simplest and most practical mechanical means for utility commercial procedure, which would give a uniform flow of fast and simple operations and as nearly as possible a guarantee of accuracy and an automatic bookkeeping and collection control, and thereby eliminate errors and omissions which are bound to result from the employment of large forces of clerks. Such a mechanical means not being available, it had to be devised. Ledgers would have to be eliminated and a duplicate record of the original operation substituted as an office record.

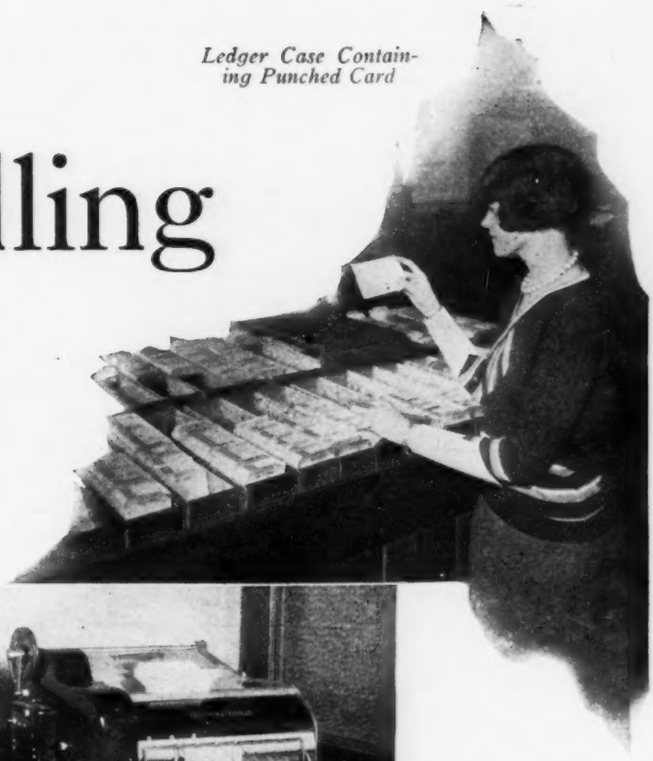
PLAN FINALLY ADOPTED

Cycle balancing of ledgers was put into effect, a bill with follow-up stubs adopted and a punched card used for printing the bill and later used for the ledger. This required the development of a fast feeding and ejecting device which could be automatically controlled to retain the bill and print more than one item and give a total, for use with the Hollerith tabulating and accounting machine, which seemed to be the most practicable and flexible printing and accumulating mechanism. Such a device was perfected as shown in one of the accompanying illustrations. A hand-fed addressograph was rebuilt to stencil automatically and serially number (and duplicate when required) across the end of the punched card.

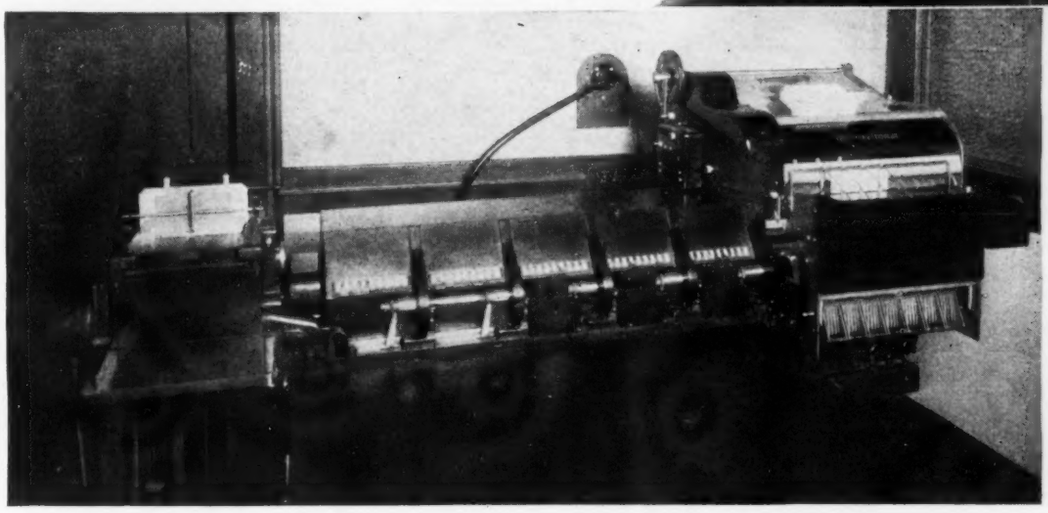
Of the department's 475,000 water and electric accounts, approximately 100,000 are billed in combination. The meter reader makes the subtraction of the previous month's reading while he is at the meter itself. Meter sheets carry a three-year history, which is a guide to the reader as to the correctness of the current reading. If the result of his subtraction appears out of line with previous months' consumption, he verifies his reading before leaving the meter and so marks it in his book.

Upon receipt of the meter book in the billing section cards are punched showing the two readings and the consumption (which is a strictly copy job), together with the book number, account number, the classification of

Solved Its Record-Billing Problem



Ledger Case Containing Punched Card



Printing Tabulator Receives Stenciled Ledger Cards and Ejects Completed Bill

service and a designation showing the block of the rate to be applied, the date of billing and the kind of service, whether light, power, water, meter rental, etc., as shown in the accompanying illustration.

After the cards are punched, all like consumptions are sorted together by means of a sorting machine. Then by application of the proper rate to each consumption group the amount of money is gang-punched by an electrically operated punch at one operation. It will be seen that by this means the application of the proper rate and the calculation of the amounts is reduced to one rate application and calculation only for each consumption group each day, and the chance for error is very slight.

At the time the meters are being read punch cards are being stenciled and numbered, and while the cards are being punched the blank bills are being stenciled. After the cards are gang-punched for the amount, they are sorted back into billing order by means of the account number (the account numbers are in numercial sequence by street and address order). All electric and water accounts to be billed in combination have two punched ledger cards, both bearing the same account number. The spacing and ejection control of the platen is in this account number. It spaces on the duplication of number and ejects when the number changes. This number also acts to keep bills and punched cards in sequence while being printed.

The punched cards are tabulated for statistical purposes and for charges to the bookkeeping control, and an accumulation is taken for each book, of the present and previous reading, and the consumption, and by this means the subtraction of the meter reader is group checked. After this tabulation the cards are forwarded to the bookeeping room for use as a ledger. Approximately 22,000 bills a day are billed in this manner by means of these tabulating machines. Two horizontal sorting machines, two gang punches and ten electric key punches are required. The bill can be prepared in this manner on either cardboard or paper, with or without stubs. The department at the present time is using a cardboard bill of government bristol of a private mailing card size, which can be mailed for 1 cent or inclosed for 2 cents.

Automatic Collection Control

All cash payments received by mail are run on duplex adding machines and all counter collections are received through cash registers. Stubs are taken from cash registers and from the mail collection room periodically during the day and the amount represented by these stubs is secured for convenience in localizing any troubles experienced in securing a balance. The adding machine totals from the mail collections as well as the cash register totals at the counters are summarized into a grand

total of collections for the day and used as a predetermined and definite amount to which the cash posters must balance. The so-called cash posting consists of sorting all cash stubs into book order and matching against and pulling by account number the corresponding punched ledger card.

After all the cards have been pulled they are tabulated and balanced against the cashier's total receipts. All accounts are by ordinance due and payable upon presentation of bill and become delinquent fifteen days after presentation. Fourteen days after mailing, all accounts unpaid, which means all the ledger cards remaining in the ledger file, are used to prepare a "Courtesy Notice" on 1-cent postcards. On these cards is printed a courteous reminder that the account is at this time unpaid and that payment must be made within three days to avoid delinquency. The average number of "Courtesy Notices" mailed daily is 4,500 out of a total of 22,000 accounts previously billed.

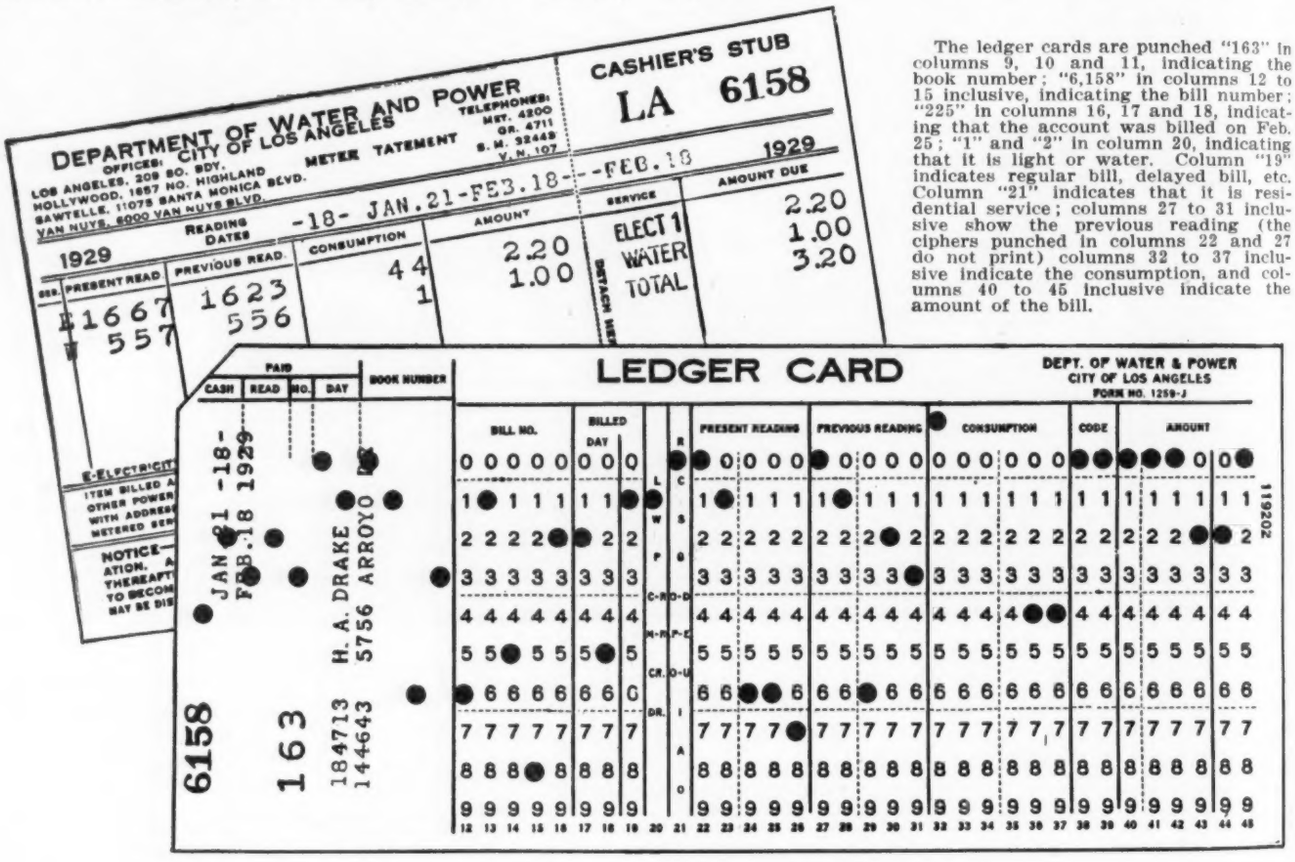
After seven days all ledger cards then remaining in the file are used to prepare a duplicate bill, made by means of the tabulator, for use in the field by special collectors. The number of these cards prepared is approximately 400 daily. After the pulling of the ledger cards by the cash-posting crew the cards are gang-punched for the date of payment and filed in numerical order, which, as has been shown, automatically places them in street and address order. This procedure, which is very simple and effective, is being done on standard tabulating and addressograph equipment with the aid of some auxiliary attachments devised and developed by the commercial division of the Department of Water and Power of the city of Los Angeles.

It was necessary to find a fast and sure method of communication between public offices and the bookkeeping and billing rooms and the telautograph was finally adopted. It gives full selectivity of stations and makes possible sending and receiving simultaneously at any point by the use of a sending and receiving machine, as shown in the accompanying illustrations. All communications having to do with consumers' accounts are handled by this means. A consumer wishing a duplicate bill, by giving the street and address, can have this request and the answer transmitted by telautograph and a duplicate bill in his hands in less time than would be required if duplicate bills were filed behind the counter in the business office itself.

Telautograph Speeds Communication

The average time required for the sending of a message and receipt of an answer as disclosed by time studies is 72 seconds. All messages sent and received are in the handwriting of the clerk. These messages are all signed and some of the requests are in code for purposes of speed in sending. The paper rolls on which the messages appear are filed and very naturally preclude any argument as to what reply was received.

This plan of billing and bookkeeping is so flexible and lends itself to expansion so readily and simply that it seems desirable to centralize all billing and bookkeeping activities in the central office in Los Angeles, contacts and communication being maintained by means of these telautograph machines. A consumer can make a request in Owensmouth, which is a distance of 40 miles from the central office, and secure the same service by specialized operators in the central office as he would if he were in the same building. It also allows of the receiving of payments in any office of the department and



The ledger cards are punched "163" in columns 9, 10 and 11, indicating the book number; "6,158" in columns 12 to 15 inclusive, indicating the bill number; "225" in columns 16, 17 and 18, indicating that the account was billed on Feb. 25; "1" and "2" in column 20, indicating that it is light or water. Column "19" indicates regular bill, delayed bill, etc. Column "21" indicates that it is residential service; columns 27 to 31 inclusive show the previous reading (the ciphers punched in columns 22 and 27 do not print) columns 32 to 37 inclusive indicate the consumption, and columns 40 to 45 inclusive indicate the amount of the bill.

Ledger Card for Electric Service and Corresponding Bill for Joint Service

proper credit being posted, regardless of the district in which the service might be located.

Some comparisons are here given to show the difference in the result of the commercial activities before the adoption of the present plan and methods used early in 1924. In 1924 the department handled 15,500 accounts daily and employed what was commonly known as the dual posting plan, which required four operations to accomplish what now requires only one, the bill being made directly from the meter book, the rate applied and calculation for amount of bill made by the billing operator on each individual item. After billing, duplex adding machine operators made a machine run of these bills to secure the book total and a segregation of electricity and water and grand totals. Posting to the loose-leaf ledgers was made by means of a standard posting machine directly from the meter book to the ledger sheet, the operator again applying the rate and making the calculations.

The ledger sheets were then removed from the ledger stubs and a machine run made by other duplex adding machine operators. The very natural result was four times as many errors to correct and reconcile as there would have been if one correct operation had been used for both billing and bookkeeping. The average output per operator in 1924 was about 800 transactions per working day and required the use of 42 posting and billing machines and a very large battery of duplex adding machines.

All bills are now made mechanically from a punched tabulating card, which is used as a ledger and for all other purposes thereafter where the same information is required. In 1924 the department had 78 field collectors and 32 office employees in the chief collector's office. All bills are now mailed and there are only thirteen special collectors and nine office employees in this section. The bookkeeping control in 1924 cost $2,025 per month. Balancing was done on all accounts at the end of the month and was always 30 days in arrears or longer. At the present time cycle-balancing is in effect and a serial is balanced each day. The present bookkeeping control is maintained and balancing is accomplished by one senior bookkeeper with the aid of four helpers.

The department's average outstanding revenue in 1924 was $1,200,000 on a gross earning of approximately $14,500,000. It is now $1,300,000 on a gross earning of approximately $23,000,000. Moreover, the number of services discontinued because of delinquency has been greatly reduced. The provision for bad debts in 1924 was $100,000, but during 1929 it will not exceed $60,000. The unpaid accounts carried forward in 1924 were 2,300 daily. Now there are only 350 daily. Shut-offs for delinquency are not made until two months bills are delinquent and, if the circumstances warrant, a longer period is granted.

In 1924 cash was posted to ledgers, by means of a posting machine, in the forenoon of the day following receipt, requiring 24 posting machines. All cash received now is posted each night, by eleven cash posters, and is in balance with the cashier by 8 o'clock the next morning.

Suggestions on Selling Electric Heat to Industries

Made by R. F. Bensinger, vice-president Electric Furnace Company, Salem, Ohio, at the recent industrial heating schools in Detroit and Cleveland

What a utility company power salesman should do—

Get thoroughly sold on electric heat.

Get as complete a list as possible of present installations and what they are operating on.

Keep in close touch with all potential users of electric heat.

Get across to them that the next time a new heating operation or a new furnace is contemplated electric heat should be considered, in view of the many successful applications. It may not be an electric application, but investigation costs little and may mean much to them.

Be conservative in all statements regarding electric heat.

When a prospect is located, call in only reputable electric furnace builders who have had experience enough to handle the proposition, or give the prospect a list of manufacturers and let him select.

Educate the customer as to the cost of any additional energy purchased above his present requirements. Show him how much lower the cost of additional energy will be, especially for a high load factor or off-peak load superimposed upon his present load.

But—

Don't set yourself up as an electric heating expert. An electric furnace is not primarily an electrical problem but a mechanical and metallurgical one.

Don't bother to acquire details of design of electric furnace construction. General knowledge is, of course, advantageous, but difference in construction can only be evaluated after years of experience and continuous close association with the business. Leave such details to the furnace manufacturer.

Don't recommend any particular type of equipment or method of operation.

Don't give the prospect economy figures. Tell him that only a careful survey can determine such figures. Sell him instead on the idea that electric heat must be economical, otherwise so many manufacturers would not be using electric furnaces. especially on such a large scale.

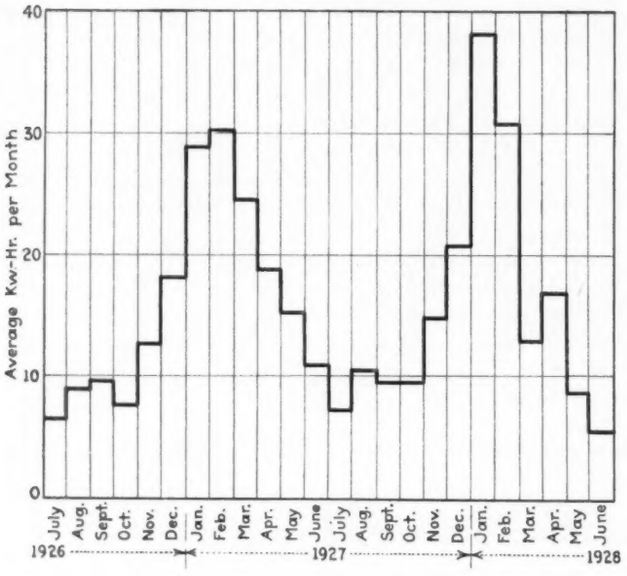
Electric Motors on the Farm

By Frank J. Zink

Iowa Project on Rural Electrification, Iowa State College

FARM equipment is most conveniently operated when equipped with individual motor drive, but there is a need and a demand for portable electric motors for general utility use. For the latter case two general sizes have been found to be desirable, the $\frac{1}{4}$- or $\frac{1}{2}$-hp. size for operating hand-turned machines and the 3- or 5-hp. size for operating the machines ordinarily driven with a 5- to 7-hp. gasoline engine.

Three motors used on farms belonging in the Iowa



Average Energy Consumption of Motors on Farm

(Iowa Project on Rural Electrification)

Project on Rural Electrification are mounted in a fixed position and utilize line shafts for transmitting the power. In these cases the uses are practically all centralized in the grain storage building. These stationary motors are used less than are the portables. For a general application of motors the fixed position type of installation is not desirable for the reason that the total cost will usually be more than for portable equipment and that the installation including motor mounting and line shafts are too often poorly designed.

Feed grinding is the only use for power from the utility motor which lasts for any considerable length of time. The grinding season varies considerably. On most farms it will last usually from six to nine months. On I.P.R.E. co-operators' farms most of the grinding is done during the late fall and winter and spring months. Energy is utilized at the rate of 16 to 60 kw.-hr. per 100 bu. ground when using plate mills.

The small motors are used but a few times each year. Often less than 1 kw.-hr. will be used for each job. Their use should be general, however, because when operating they will usually replace the work of one man. From the standpoint of energy consumption they are of little value as a load builder, but from the viewpoint of the farmer they are important as time savers. On the co-operators' farms this type of equipment was used for grain cleaning, seed corn shelling, seed corn grading, meat chopping, sheep shearing and for farm shop tools.

Set 3 Watts per Sq.Ft. as Minimum for Commercial Lighting

RECOGNIZING the desirability of standards for wiring of commercial structures, the commercial lighting committee of the Pacific Coast Electrical Association undertook and completed the preparation of such a set of standards. Early during the preparation of these standards it was realized that they were striking at a fundamental problem of the industry and when completed would be sufficiently important to warrant the most serious promotion the industry could give them.

Consequently the committee recommended to the California Electrical Bureau, a co-operative organization representing all branches of the industry, that the bureau give consideration to the possibility of adopting and promoting the standards as a companion piece to the "red seal" program. This recommendation met with the approval of the advisory committee of the bureau, with the result that the same methods of promotion found successful in promoting the residential wiring program will now be employed in furthering the interests of adequate wiring for the proper illumination of commercial structures. Owners of buildings wired to conform to these standards will receive certification as to the adequacy of their electrical installation.

The standards call for a minimum of 3 watts per square foot of floor area excepting in certain parts of auditoriums, hospitals, hotels, depots, schools, garages, halls, passageways, corridors, etc., where either lower wattages will be permitted or higher wattages are specifield. Spacing of outlets, maximum area to be lighted from one outlet, services, feeders, convenience outlets, show-window lighting and other subjects of importance also are covered.

Uses of Large Size Motors on the Farm

(Iowa Project on Rural Electrification)

Farm No.	Motor Hp.	Mounting	—Year Total Kw.-Hr.— June, 1926 to June, 1927	June, 1927 to June, 1928	Use
2*	5	Stationary	249	175	Grinding, elevating, shelling corn and wood sawing.
3	5	Skids	402	417	Grinding, elevating, shelling corn and wood sawing.
4	5	Four-wheel truck	299	313	Wood sawing, roughage cutting and elevating grain.
6	5	Stationary	167	97	Elevating, shelling corn, and some grinding.
7	5	Stationary	55	79	Elevating, hoisting hay, shelling corn, and a little grinding.
8	5	Two-wheel warehouse truck	160	165	Elevating, wood sawing, and corn shelling.
9	5	Two-wheel warehouse truck	...	140	Grinding only—used only five months.
10	5	Two-wheel truck	183	192	Elevating, shelling corn, grinding, meat chopping, tool sharpening and mixing concrete.
11	3	Four-wheel truck	119	92	Elevating, sawing wood, grinding and shelling corn.
Monthly average use			17.6	15.4	

*Co-operators No. 1 and No. 5 did not use large motors.

Letters from Our Readers

When a Literary Man Turned Prophet

To the Editor of the ELECTRICAL WORLD:

Lafcadio Hearn, famous as an essayist of Irish and Greek extraction who, in the course of a checkered career, became first half an American and then wholly a Japanese, lived in New Orleans for a while, where just 49 years ago he was a writer on the staff of the *Item*. Apropos of the lighting semi-centennial jubilee, perhaps you will think the following portion of an editorial on "The Electric Light," written by him on July 20, 1880, worth reprinting:

It is true that there is a generally prevalent, and no doubt correct, opinion that electric illumination is as yet in its infancy and that by waiting a few years a far more perfect and cheaper system of lighting than any at present in vogue will be ready to meet all public wants. But that is no reason why we should still continue to pay for gas while we can have a far better light at far less cost—even granting that our electric machinery is in a somewhat embryonic condition.

We shall not have to wait ten years or anything like it in order to see American cities illuminated by artificial lighting. Electricity is being rapidly introduced throughout the North and has been very extensively used at Paris for a long time—where it will no doubt be universally substituted for gas at no distant day. The mere fact that the light, within six months after its invention, has been adopted in theaters, public halls, pleasure resorts, parks and lighthouses is a certain guarantee that before another year it will be adopted for nearly all public purposes of illumination, and before two years have passed it will no doubt be used as a substitute for gas in private residences.

It occurs to us in this connection to make a little suggestion. The chief expense in the establishment of the electric light is the cost of engines, fuel and attendance. Might not the enormous hydraulic power which we could draw from the Mississippi River be utilized for public illumination? If one or two engines can supply a whole city with water, why could not the river itself supply the motive power necessary to illuminate a city? This is a matter for engineers and electricians to consider, and it seems to us to involve a question of economy eminently worthy of consideration.

New York, N. Y. JONATHAN LIBERVERMIS.

Mental Lapses Cause Accidents

To the Editor of the ELECTRICAL WORLD:

We have many safety slogans intended to show that accidents are always caused, and more than often by carelessness. After an accident has happened, and we attempt to analyze each detailed move and thought leading up to the accident, too often is it discovered that too much reliance was placed on a human brain. Almost invariably one or more mental lapses have occurred. Those who faltered had the reputation of being able to use their heads. Can it be that we expect too much of our employees who work in unsafe places?

The writer has noted many instances where men with minds trained to concentrate have been trapped while concentrating on the immediate work at hand but who allowed the sources of danger to fade from their minds for the moment. Did you ever stop to think what a surprisingly small number of objects or thoughts can be held in one's mind at a given moment? Due to this fact some of our minds have been developed through generations to shift rapidly from one group of thoughts to another, somewhat as a motion-picture machine works, thus keeping a complicated situation constantly in cognizance, while others have evolved minds which will persistently cling to a single subject until its owner deliberately wills it to shift gears.

Professional fighters, aviators and hunters must avoid pure mental concentration and keep their minds and muscles in constant readiness to act suddenly on external impressions received through their five senses. They must be aware of many sources of danger at one time and necessarily cannot keep their minds concentrated.

On the other hand, professors, poets, inventors and highly skilled workmen who drive their minds to stay on the problem at hand must shut out all temptations to change their lines of thought and to be conscious of many objects and sources of danger at once. This type of mind gives the world new ideas and inventions, but persons having such minds are called absentminded and have some narrow escapes when crossing crowded streets.

Thus we have two types of concentration, the alert type, which never dreams or originates, and the pure mental, which originates new things but is absentminded.

Men who build and maintain modern electrical systems must have minds which embrace both types. A mind overdeveloped from pure mental concentration makes its owner a distinct hazard around live work. This explains how the most skillful workers are sometimes electrocuted from unexpected sources while concentrating on the work at hand. It should not be said of those who have made the supreme sacrifice that they did not think, and it was all their fault. It may be their burdens were too heavy.

A foreman must use thinkers on hazardous jobs, but a foreman who allows himself to be interrupted with details of his day's work and fails to concentrate on his thinkers' safety is headed for sorrow. Again, a foreman who does the most hazardous parts himself without insisting that his best man concentrate on his protection will suffer from misplaced self-confidence. Being human, he cannot be flawless.

These human limitations are not always remembered by those of us whose search for a livelihood leads them into unsafe places. We have all met:

The fool greenhorn who brags of the risks he takes.

The feebleminded man who thinks he is born lucky and leads a charmed life.

The overproud foreman who thinks his men good enough to take care of themselves without watching.

The timid soul who hesitates constantly to warn another for fear of hurting his feelings.

The inexperienced designer who believes men exposed to danger will always act in a logical manner.

In summarizing, I would say that no man on dangerous work can concentrate on work and danger at the same time. This feat requires a minimum of two minds, both of which are alert and one of which must continuously concentrate on the other's safety. W. W. PALMER.

Southeastern Engineering Company,
Birmingham, Ala

"A Testimonial to a Civic Service"

To the Editor of the ELECTRICAL WORLD:

I wonder whether the above editorial, which appeared in the June 29 issue of the ELECTRICAL WORLD, is a "testimonial to a civic service" or a reflection on the adequacy of the street-lighting system in the theater district of New York.

Judging from Commissioner Whalen's action in calling off the demonstration of New York's theater district without its signs, it is evident that he is convinced of the value of adequate lighting in promoting safety and facilitating traffic movement. But why depend on advertising signs to light the streets of the largest city in the world? L. A. S. WOOD,

Manager Street Lighting Section.
Westinghouse Electric & Manufacturing Company,
South Bend, Ind.

Digest of Electrical Literature

Hydro-Electric Development and Steam Equipment

10,500-Kw. Diesel Engine Operation.—A nine-cylinder Diesel engine of 15,000 hp. connected to a 10,500-kw. alternator was installed in the power station of the Hamburg Electricity Supply Company and started to operate in September, 1926. This installation is about 20 per cent of the total capacity of the steam turbine-driven generators installed in this station. The average number of working hours of the Diesel set per annum is about 800. Most of this time was involved in the utilization of the Diesel set to supply peak-load demands, but on some occasions the engine was employed for base-load service. During the year 1928 the use factor of the steam plant was improved nearly 18 per cent by utilizing the oil engine for peak loads. The fuel consumption of the steam set per unit generated was improved by about 1,000 B.t.u. The total energy generated by the Diesel set during the peak-load hours of 1928 was 3,351,300 kw.-hr., or 2.75 per cent of the total generated in the station. The manager reports very satisfactory operation of the engine set, with fuel consumption well below the guarantees of the makers, the average consumption not being more than 0.55 lb. of oil per kw.—*Engineer (London)*, July 19, 1929.

Peterborough Station—The recently opened generating station of the City of Peterborough Corporation in England is interesting from the point of view that this station will hold a key position in the development of the large power grids now under way in England. The station is one that burns pulverized fuel entirely and is of interest also because there is no partition wall between boiler and turbine room. The station is limited by an available circulating water supply to 50,000 kw., but may be brought to double this capacity through the aid of cooling towers. The boilers have a heating surface of 15,000 sq.ft., excluding the superheater. The combustion chamber of each boiler is surrounded by water tubes on all four sides and has a volume of 5,570 cu.ft. Ash is disposed of through a water sluice. Each boiler is capable of evaporating 75,000 lb. of steam per hour, using natural draft only. The steam pressure is 260 lb. per square inch at the boiler with a superheat temperature of 750 deg. F. At the present time two units are in operation, one of 12,500 kw. and one of 6,000 kw. respectively. Both are generating at 6,600 volts, three phase, 50 cycles. The switchgear for the high-tension equipment is of the cell type, and of the iron-clad or closed type for the low-pressure switches. The working efficiency obtained with the station is 18 per cent, using low grade fuel of about 9,000 B.t.u. value. The capital charges for the new station amount to 15.1 lb. per kilowatt.—*Electrical Review*, July 12, 1929.

Generation, Control, Switching and Protection

Surge Protection—E. T. NORRIS—A surge absorber developed by Ferranti, Ltd., is described by Mr. Norris. This protector consists of a choke coil inclosed in a tank filled with oil, wherein the coil in combination with the surrounding tank gives a balanced surge arrester wherein the surrounding steel of the tank is connected to the earth and acts as a dissipator of energy. It is stated that the inductance coil of the absorber acts as a primary winding of the transformer, with the steel tank acting as a short-circuit secondary winding of one turn. It is also stated that the magnetic field accompanying the surge current in any part of the winding will set up eddy current losses in the adjacent metal sheet or energy dissipating part of the absorber. For high-frequency effects the absorber is particularly useful to smooth out ripples.—*Electrical Review*, July 12, 1929.

Transmission, Substations and Distribution

Concrete Pole Designs and Costs.—W. T. TAYLOR.—Inefficiency of existing constr..ctional methods, why concrete poles should be made on site, some interesting features of one process and detailed costs are presented in this article. The high first cost of concrete poles is one of the principal objections to their use, so the author points out how this can be reduced by casting them in place, thus saving haulage and erection problems and expense. By so doing the ground around the base of the pole requires the least disturbance, as the foundation may be cast in place. Allowing the concrete to set while the pole is in the vertical position also assures the strongest concrete at the places of maximum stress. The line loadings for which the poles are designed are given in detail with the itemized construction costs, which range from £151 to £236 per mile of line, excluding attachments such as crossarms, insulators and conductors for 33- to 42-ft. poles.—*Electrician (London)*, July 26, 1929.

Wiring for the Farm—COMMITTEE ON THE RELATION OF ELECTRICITY TO AGRICULTURE.—The problem of wiring the farms of the country for light, heat and power has faced the Committee on the Relation of Electricity to Agriculture for some years and has required the development of a complete treatise on this subject, which is now available. The bulletin takes up in the utmost detail the basic methods of getting a farm wired for electric service and advocates adequate wiring at all times and competent men to do the wiring. It includes, moreover, details of the house, the layout, rules for wiring for lights and other services, details of wiring practice such as making joints and details of all switches and switch connections, and discusses in special cases such items as the barns, the outbuildings, the poultry houses and other parts of the farm itself. Included in the bulletin is a large volume of illustrative matter and a description of methods for installing motors and power apparatus, including the transformers and connections from transformers to motors and switch boxes.—*Committee on the Relation of Electricity to Agriculture*, Chicago, Ill.

Miscellaneous

Fixed Capital Records System—Serial reports of fixed capital committee, Accounting National Section, N.E.L.A. This committee of the N.E.L.A. recommends the adoption of a fixed capital records system by utility companies because it provides and perpetuates the data necessary for any company to care for its insurance and taxation requirements. The basis of the record system is that there should be (1) a complete and accurate description of perpetual inventory and record of cost of all property which should be covered by insurance of various kinds or which is subject to taxation in any political subdivision; (2) a basis for excluding from insurable values the value of property not intended to be covered by insurance or parts of property excluded from coverage such as foundations, etc., thus assuring correct coverage and eliminating the payments of insurance premiums for non-insurable property; (3) a basis for segregating and excluding the value of any property not subject to taxation or for determining the correct number of units of property on which certain taxes are based; (4) values of taxable property which can be used as a basis to determine whether the assessment for taxation purposes is correct, thus preventing unjust tax assessments and the consequent payment of excess taxes; (5) a record of additions, betterments, improvements and retirements of property, thus providing an accurate and practically automatic method of revising insurable values or tax assessments and eliminating possible payment of insurance premiums or taxes after property has been removed; (6) a basis for settlement of claims for loss against insurance of various kinds which guarantees that the amount of the claim can be substantiated; (7) other information and details of property used in general in connection with the maintenance of proper insurance and tax records.—*National Electric Light Association*, New York City.

Book Reviews

Handbook of Corporate Management and Procedure

By Karl A. Saliers, formerly professor of accounting Northwestern University. New York: McGraw-Hill Book Company. Price, $7.50.

About every situation that would be faced by an executive in business or industry in the course of his corporate procedure and duties seems to be most minutely and carefully covered in this publication, right from the earliest stages when a charter is secured. The emphasis in the present volume is placed upon legal financial and managerial problems arising in corporate procedure, and it is intended primarily as a reference work to be consulted as these problems arise. The scope of the work is exceedingly wide and covers the field in which dependable information is greatly in demand, as there is no adequate training school for corporate management, except experience. An outstanding example of this is the chapter on the charter. This covers the various requirements, both statutory and special, in connection with the floating of a wide variety of corporations. It discusses the nature of the certificate of incorporation, the charter amendment, qualification of incorporators and a myriad of other questions pertinent to the formation of a new enterprise.

Direct-Current Electricity

By L. Raymond Smith. New York: McGraw-Hill Book Company, Inc. 262 pages, illustrated. Price, $2.

This is a text for the use of students in the electrical trades. It covers in a practical manner the elements of direct-current circuits and apparatus. A profuse use of illustrations adds to the value of the work and makes for clearness. Review questions and problems focus attention on the contents in a tangible manner. While elementary in character, the author gives a very thorough treatment of fundamental topics and applications.

Electrical Utilities—The Crisis in Public Control

By Dr. William E. Mosher and his staff associates of the School of Citizenship and Public Affairs, Syracuse University. New York: Harper & Brothers. 335 pages, illustrated. Price, $4.

The holding company as a definite obstacle in the path of public control of the electrical utilities and the prediction that unless a new leadership develops within this industry additional legislative restrictions will be imposed upon it and present attacks will continue are the highlights in this book on the structure and functioning of holding companies.

The book gives an analysis of the situation which has led up to what the authors term a crisis and concludes with five suggested solutions to the problem, which, they declare, is "rapidly emerging as of dominating importance for the economic and social progress of the nation."

These solutions are (1) control by direct contract between the state and the company; (2) public competition through the further development of such projects as Muscle Shoals and Boulder Dam and sale by the government of power; (3) control by a league of municipalities similar to the one which has been in operation in the Canadian province of Ontario for twenty years; (4) control through a national planning commission, and (5) government ownership.

The authors do not approve of government ownership and control except as a final resort. However, they are emphatic in their assertion that "the primary condition of public ownership of any public utility is dissatisfaction with the cost and service standards available under private operation."

In their treatment of the subject the authors state that "effort has been made to avoid dogmatic theory and prejudice and to proceed on the basis of factual and reviewable evidence," but electrical men who know the industry will challenge their facts and their conclusions.

"It may be confidently predicted," they write, "that the present policy of high rates, of resisting control at every point, of secretiveness with regard to financial operations and of the dubious manipulation of public opinion will be but the initial step in the direction of a public power monopoly. The alternative and the only safe policy for a public utility enterprise is acceptance of such changes in the regulatory system as will eliminate the unfortunate practices which have grown up in recent years."

A number of factors are ascribed by the authors as contributing to the crisis. They include, first, the failure of public service commissions, hampered by restrictive legislation, satisfactorily to perform their functions; second, the only government agency with any jurisdiction over the electrical utilities, the Federal Power Commission, "is so seriously handicapped in both organization and staff that it is all but impotent to carry out the functions imposed upon it by law," and, finally, that there is a very appreciable area of public utility operation subject to no control or supervision whatever.

Other factors entering into the problem, the authors find, are inadequate funds for the enforcement of public service commission decisions; an increased tendency on the part of the commissions toward judicial functions, rather than an active interest in uncovering abuses and practices not conducive to public well-being; inability to control rates due to lack of definite mandates from state legislatures, and the inability to control the increasingly great amount of power being shipped over state boundaries.

Some Conclusions of Authors

In their conclusions the authors state: "There is no valid reason why the authority of the federal government should be invoked in bringing about a truly sound national scheme except that the major part of the industry is evidently in the hands of those who look upon it as any speculative and competitive enterprise. The operators—that is, those who produce and distribute units of electrical current—are no longer in control. They are now under orders. Many of them had and have convictions about serving the public and are fully aware of their obligations because of the advantage this utility enjoys at the hands of the public. But the majority of those determining policies seemingly overlook any such responsibility. They do not consider themselves as the custodians of public resources and rights, nor do they seem to appreciate what great contributions to social and economic well-being they might make by expanding their services and reducing prices. Great economies have undoubtedly been effected by their engineering and financial enterprise. For these they should receive their appropriate reward. But what meager advantages have accrued to the public, their partners in the undertaking!

"What is at stake is not the avoidance of flagrant dishonesty and actual misdeeds, but rather a restatement of the philosophy of public utility service that will square with the changing standards and ideals of the day. Under leadership imbued with such a philosophy secrecy would be taboo, resistance to reasonable control would vanish, publicity would be honest and aboveboard and the public would automatically enjoy its proper share in increased efficiency and improved organization without having constantly to take recourse to commissions and courts.

"Without such leadership we may look forward to an unbroken series of appeals and costly litigation, to continuous lobbying by all parties concerned before legislatures and Congress, to growing dissatisfaction on the part of the public and ultimately to rigid and sweeping regulation such as exists with the railways, if not to state ownership and operation."

The authors would have done well to discuss the situation with experienced utility men, for the study is tinged with a "pinkness" that reflects a popular conception of utility structure and philosophy instead of the thorough knowledge available only to those born and bred in this complicated industry.

News of the Industry

Power Rights in Hudson River Sold

Negotiations for the purchase of the water-power rights of the Union Bag & Paper Power Corporation of Hudson Falls by the Mohawk-Hudson Power Corporation of Albany are under way. They are expected to lead to a $10,000,000 hydro-electric development on the upper Hudson River with a rating of 75,000 hp.

The site for the project on the highest falls of the Hudson River is the greatest left in the state to be developed and will provide a head of 85 ft., as compared with the 36-ft. head of the Spier Falls plant. The power has been in use for more than 125 years and the new plan calls for a single dam and a power station at an estimated cost of $6,000,000. The water-power rights are reported to be valued at $4,000,000, which is in addition to the sum mentioned.

Americans Buy Mexican Power Companies

The American & Foreign Power Company of New York is said to be negotiating for the purchase of the electric power plants, transmission lines, street railway system and other holdings of the Mexican Light & Power Company, owned by British interests. The hydro-electric plants, situated in the mountains about 100 miles from Mexico City, provide power for the capital, Puebla, El Oro and other cities and industrial centers.

The Electric Bond & Share interests have been active for some time in acquiring electric power plants in the states of Yucatan, Guanajuato, Puebla, Chihuahua, Coahuila, Durango, Vera Cruz and Nuevo Leon. In April of 1928 the American Foreign Power Company acquired control of the Mexican Utilities Company and in February of this year it purchased the outstanding common stock of the Northern Mexico Power & Development Company.

Mexico Wants Colorado River Water

The Government of Mexico will insist upon the distribution of the waters of the Colorado River, after the construction of the Boulder Dam, upon a basis of absolute equality with the United States.

This important question will come before the meeting of the International Water Commission opening in Mexico City on August 20, and following this meeting it is expected that a treaty will be negotiated between the two countries setting forth the terms of the distribution.

While it is the intention of the Mexican government to insist upon its right to equal participation, it is possible that some temporary arrangement may be agreed to by the Mexican commissioners whereby the United States should receive a larger share of the water for the time being.

The question of the Colorado is the most important on the agenda of the Mexican City meeting. There are, however, two other questions scheduled for consideration, namely, the waters of the Rio Grande and those of the Tia Juana River.

Anonymous Memo Creates Great Stir in Washington

Document Purporting to Come from Some One in Utility Industry Is Alleged to Be Attempt to Influence the Federal Power Commission—Evidence of Its Source Cannot Be Obtained

AN ANONYMOUS memorandum indicating that the National Electric Light Association is working through the Chamber of Commerce of the United States and in other devious ways to avoid the application of the accounting regulations promulgated by the Federal Power Commission under the water-power act is being featured by the Baltimore *Sun* in a series of articles critical of the electrical industry. Paul S. Clapp, managing director of the N.E.L.A., has issued the accompanying statement denying that the memorandum originated in that association and stating that it does not express the sentiments, opinions or viewpoints of that association.

When J. Fred Essary of the Baltimore *Sun* was asked if the *Sun* were not treating an anonymous memorandum as though it were a thoroughly authenticated statement from a responsible source in the industry, he replied that he has ample evidence of its authenticity but declined to reveal its source.

Persons familiar with the electrical industry who have studied the memorandum say that the wording of the article indicates that it came from a person who is familiar with accounting but who has only superficial knowledge of the water-power act and the organization of the Federal Power Commission. It did not originate in a responsible or well-informed quarter.

The first supposition was that the document has been secured in the course of the Federal Trade Commission's search of utilities companies' files. But William V. King, chief accountant of the Federal Power Commission, states emphatically that the document did not come from his office and disavows all knowledge of it. Every effort up to the time of this writing to learn the source of the document has failed. All that is known is that it was distributed to a number of newspapers by the correspondent of the Telegraph Association of the Soviet Union. Although Senator Norris has had the document in his possession for some months, he did not place it in the *Congressional Record*, apparently, because of his doubt as to its authenticity or responsible character.

Senator Couzens of Michigan, chairman of the interstate commerce com-

Statement by Paul S. Clapp

Managing Director N.E.L.A.

An undated, unsigned and unidentified memorandum has been placed in circulation by an unknown source dealing with the relation between the electric utilities and the Federal Power Commission. It purports to be a memorandum by some one connected with the utilities.

The memorandum was not issued by the National Electric Light Association, by any of its committees, or by any person or organization in its behalf. If any such memorandum were written, it certainly does not have authority and does not express the sentiments, opinions or viewpoints of the National Electric Light Association.

I have made every effort since the appearance of newspaper accounts to determine both the author of the memorandum and the source responsible for its diffusion, but without success. The issuing source continues to shroud itself with mystery, refuses to divulge information as to the author, and thus far disavows willingness to assume responsibility for circulation of such a serious accusation.

mittee of the Senate, states that it may be necessary for his committee to establish the source whence the document came.

At the offices of the Joint Committee of National Utility Associations surprise was expressed that any such views should be voiced at the time the undated memorandum apparently was written, since various agreements have been reached with the chief accountant of the Federal Commission which indicated a disposition on the part of each party to co-operate until some of the principles involved can be determined by court action or otherwise.

Internal evidence suggests that the paper was written about last March or April, probably after the new administration began and certainly before Mr. Merrill had resigned his government post to accept the secretaryship of the World Power Conference. This act of Mr. Merrill's and the fact that the Power Conference receives large utility contributions drew press comment as evidence substantiating the document. A more prevalent viewpoint is that the unknown author was an underling, hired or retained, who wanted to put up a big front before his superior.

Alleged attempts to influence Cabinet officers through the water power policies committee of the United States Chamber of Commerce are patently absurd, chamber authorities point out, since the committee never has been in a position to act as a unit. The members are drawn from several interested professions to represent banking, farming, engineering, manufacturing, and, of course, the utilities as well. It is true that the points at issue were discussed during closed hearings which were held toward forming a policy not yet formulated even in rough draft. But it is equally plain to those familiar with the chamber's cautious methods that the committee could not have taken any action, sanctioned or unsanctioned, as suggested in the memorandum.

Sentiment through the government offices on the story is one of watchful waiting and a sincere desire to bring the author and the unknown parties responsible for the paper's circulation out into the open. No one is much disturbed over the matter at the Federal Power Commission. A check-up through many bureaus of the Interior Department up to the office of Secretary Wilbur, who is away, reveals no knowledge of the document prior to press release. The Federal Trade Commission is interested, but wants to see evidence proving or discrediting. It appears that the subject is not directly in line with the Walsh resolution on which the commission's public utility investigation is based and might even lie outside the Federal Trade jurisdiction without some new order from Congress. So many senators and representatives are away that little information can be gathered on Capitol Hill. It seems, however, that if the source of the memorandum is not revealed before the Senate convenes on August 19 speedy steps will be taken to bring out the truth.

League Men Discuss Their Problems

Representatives of 43 local electrical leagues held their eighth annual conference this week, gathering at Camp Co-operation, Association Island, Henderson Harbor, N. Y., with 200 in attendance. R. Bourke Corcoran of Chicago, chairman of the League Council, presided, sessions continuing from Friday until Tuesday. He announced the establishment of a joint committee, comprising four members of the League Council and three representatives of the National Electrical Manufacturers' Association, to arrange the basis for financial support of league work by national manufacturers, under which the distribution of money appropriated as subscriptions to the development work of local leagues will be apportioned a central clearing house in accordance with the proficiency of the local organization. At the present time, he said, only five national manufacturers are contributing to more than five local leagues. The total league budget is at present $662,000, of which the power companies provide $330,000 and local members, mainly contractors, dealers and jobbers, $264,000, and national manufacturers $68,000. In the face of the growing importance of league activities in the promotion of markets and the guidance of local trade relations, the need for a more orderly and adequate basis for financial support is recognized.

The operation of the "red seal plan" for encouraging adequacy in house wiring has been considerably extended since the last conference. Ten more cities have organized "red seal" work and 1,800 applications for certificates were recorded in June. Organized educational work among the small contractors has been undertaken in several cities.

The program embraced a broad discussion of league operation and financing and, in addition, the following addresses: "The Place of the National Electrical Code in Our Business Development Work," A. Penn Denton, engineer National Electrical Manufacturers' Association; "Franklin Red Seal —A National Plan to Increase Lighting Business," Arthur E. Allen, vice-president and general manager Westinghouse Lamp Company; "How to Sell New Lighting Equipment to Old Homes," Charles L. Benjamin, managing director Artistic Lighting Equipment Association; "Building and Maintaining Satisfactory Relations with Architects," Leroy E. Kern, technical secretary the American Institute of Architects.

R. Bourke Corcoran was re-elected chairman of the League Council and D. C. Burdsell vice-chairman. The council for the coming year will consist of the following:

New England, J. J. Caddigan, Edward Cabot; Eastern, J. H. Van Aernam, D. C. Birdsell, Earl Whitehorne; East Central, J. E. North, L. E. Coen; Middle Atlantic, H. A. Brooks; Southeastern, J. J. Brennen, Walter W. Kennedy; Great Lakes, R. Bourke Corcoran, E. C. Hunter, J. S. Bartlett; North Central, John S. Hogan; Middle West, C. H. Christine, C. F. Farley; Southwestern, no election; Rocky Mountain, E. E. Sturgeon; Northwest, R. E. Folland; Pacific Coast, no representative; Canada, J. G. Glassco, G. W. Austen, James Lightbody.

A.I.E.E. Committee Appointments

At the meeting of the board of directors of the American Institute of Electrical Engineers held in New York on August 6 President Smith announced the committee appointments for the administrative year beginning August 1, 1929. Among the chairmen appointed were the following:

General Committees

Meetings and Papers, A. E. Knowlton, Yale University; Public Policy, D. C. Jackson, Massachusetts Institute of Technology; Standards, F. D. Newbury, Westinghouse Electric & Manufacturing Company; Edison Medal, Samuel Insull, Commonwealth Edison Company; Lamme Medal, Charles F. Scott, Yale University.

Technical Committees

Automatic Stations, F. Zogbaum, New York Edison Company; Communication, G. A. Kositzky, Ohio Bell Telephone Company; Education, Edward Bennett, University of Wisconsin; Electrical Machinery, Philip L. Alger, General Electric Company; Electric Welding, A. M. Candy, Westinghouse Electric & Manufacturing Company; Electrochemistry and Electrometallurgy, P. H. Brace, Westinghouse Electric & Manufacturing Company; Electrophysics, O. E. Buckley, Bell Telephone Laboratories; General Power Applications, J. F. Gaskill, Philadelphia Electric Company; Instruments and Measurements, Everett S. Lee, General Electric Company; Applications to Iron and Steel Production, M. M. Fowler, General Electric Company; Production and Application of Light, George S. Merrill, National Lamp Works; Applications to Marine Work, W. E. Thau, Westinghouse Electric & Manufacturing Company; Applications to Mining Work, Carl Lee, Peabody Coal Company; Power Generation, F. A. Allner, Pennsylvania Water & Power Company; Power Transmission and Distribution, H. R. Woodrow; Brooklyn Edison Company; Protective Devices, E. A. Hester, Duquesne Light Company; Research, S. M. Kintner, Westinghouse Electric & Manufacturing Company; Transportation, Sidney Withington, New York, New Haven & Hartford Railroad.

Howell Wants Public Hydro Plant

Senator R. B. Howell of Nebraska has announced he will seek an appropriation of $10,000,000 for a publicly owned power plant on the Platte River in Nebraska, probably at the next regular session of Congress.

The Senator's plan would provide for a dam across the river. Water used for power purposes then would be available for irrigation, he said. Army engineers are now making a survey.

Notes from the Dominion

Beauharnois Project Aims at 2,000,000 Hp.—Lac Seul Plant Completed—Plans for Montreal, Nigger and Michipicoten Rivers — Transmission from Ghost River

PROMOTERS of the Beauharnois project, development of the St. Lawrence River for hydro-electric power by means of the construction of a canal from Hungry Bay on Lake St. Francis to Melocheville on Lake St. Louis, took occasion at a complimentary banquet to the president, Frank P. Jones, at Valleyfield, Quebec, to state that the final aim of the Beauharnois Light, Heat & Power Company is the development of 2,000,000 hp. The present plans call for a development of 400,000 hp., but it was made clear in the speeches that the ultimate aim is the development to the full capacity of the river. This, explained R. O. Sweezy, vice-president of the company and originator of the project, would mean cessation of navigation in that stretch of the river now used for what is called "shooting the rapids." It might also mean that the protective works would go entirely across the river.

A hydro project involving expenditure of $1,000,000 is announced by the Canadian Northern Power Corporation, which will build a power plant on the Montreal River, near Cobalt, Ontario. The site of the new development is the Upper Notch, about 20 miles from Cobalt. The proposed installation is 13,000 hp., and the intention is to connect up with the Canada Northern system for supplying power to the mines of northern Ontario. A dam will be constructed with a head of 48 ft.

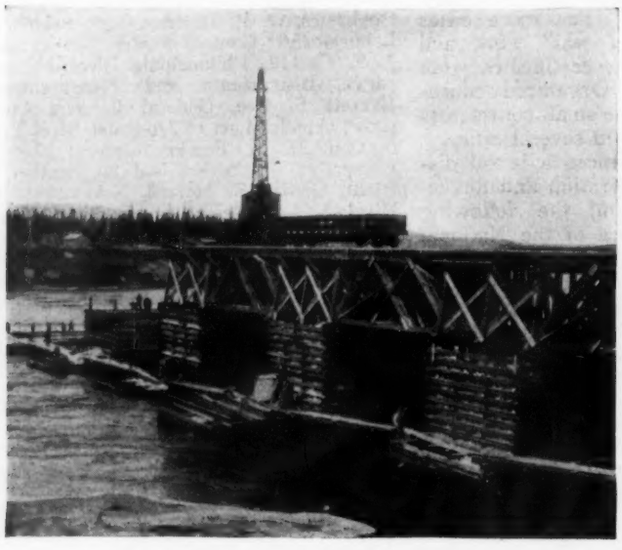
The power dam at Lower Ear Falls, at the outlet of Lac Seul, in northwestern Canada, has been officially pronounced ready for operation. This dam is 600 ft. in length, 48 ft. in height, and consists of 20 sluices each 14 ft. wide, with an earth embankment 600 ft. long. A power house immediately below the dam is now under construction which will contain one 5,000-hp. and two 10,000-hp. turbines. Power from the initial 5,000 hp. will be supplied to mines in the district over a 44,000-volt transmission line, 45 miles in length.

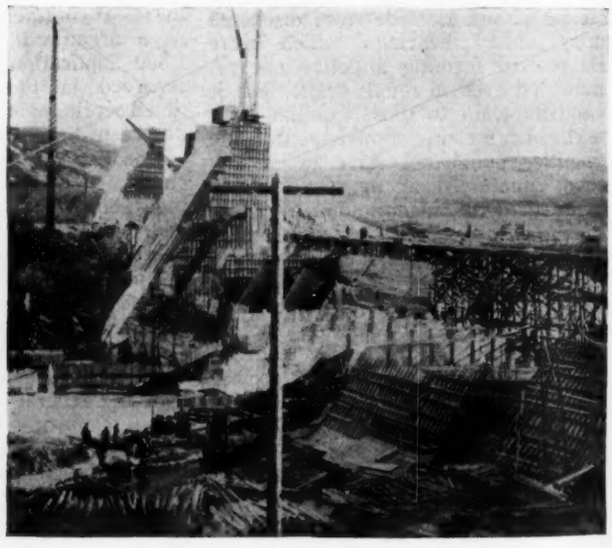
The Power Corporation of Canada, Limited, has started work on a new dam and hydro-electric station at Burroughs Falls, on Nigger River, in the Province of Quebec. The design and construction of the entire unit will be in the hands of the Power Corporation, which is doing the work for the Southern Canada Power Company. The falls are about 90 ft. high, and a series of rapids extend about a mile and one-half above them. The dam will be constructed in the narrowest part of the river about one mile from the falls. This will enable the company to utilize the additional head of water formed by the rapids. The initial installation will be about 2,000 hp.

Speaking at the turning of the switch for the first section of a new street-lighting system in Sault Ste. Marie, Ontario, John A. McPhail, vice-president of the Algoma District Power Company, announced that instructions had been issued for the erection of a permanent dam, 150 ft. high, at High Falls, on the Michipicoten River. This, with the new unit which is now being installed at the power house at Michipicoten Falls, will make available at Sault Ste. Marie within a year from now 15,000 hp. in addition to the 10,000 hp. which is to be delivered from that source almost immediately. The new dam will also make it possible by the installation of a third unit to deliver a further 12,000 hp. at short notice.

A contract for the construction of a 66,000-volt power line, costing approximately $300,000 and running from the Ghost River power project in Alberta across country to Innisfail, has been awarded by the Calgary Power Company to the McGregor Construction Company of Edmonton. Work will commence at once, and the line will be so constructed that in the event of other centers being connected with the circuit, its capacity may be increased to 132,000 volts.

Two Large Western Canadian Hydro-Electric Projects





ON THE left of the two illustrations is shown the cofferdam of the twenty-million-dollar hydro-electric development being undertaken by the Northwestern Power Company, a subsidiary of the Winnipeg Electric Company, at Seven Sisters Falls, on the Winnipeg River, Manitoba. As already told in the ELECTRICAL WORLD, this plant, about 65 miles from Winnipeg, with a total head of 66 ft., is eventually to comprise six units of 37,500 hp. each. Three of these will compose the first installation.

The picture on the right shows the work under way by the Calgary Power Company at what is known as the Ghost site on the Bow River, about 33 miles west of Calgary, Alberta. The undertaking involves spanning the Bow River valley immediately below the entrance of the Ghost River, the dam having a total length of almost a mile and providing a head of 105 ft. and a pondage of 45,000 acre-feet. The power station, which is designed to contain three 18,000-hp. units, two of which will be installed in the near future, is of concrete construction and is integral with a concrete gravity dam founded on rock.

Flanking this dam to the southward is an earth-fill dam with a maximum height of about 65 ft., which extends about 2,000 ft. The Calgary Power Company's system already includes two other hydro-electric stations on the Bow River, the Horseshoe Falls station with 20,000 hp. and the Kananaskis station with 11,600 hp. The transmission network covers a large part of southern Alberta.

Army Engineers Survey the Nation's Rivers

Will Report to Congress in December—Data on Smaller Streams Will Precede Those on Tennessee, Columbia and Others of Great Size

REPORTS on the flood control, power development and irrigation surveys being conducted by the army engineers on two hundred of the nation's streams will be available to Congress when it convenes in December. This study, which was authorized by Congress two years ago, has been progressing steadily since that time, and it is believed that the work will be entirely finished in three years. As the surveys on the important rivers will require the longest time, the reports that will be submitted to Congress will be, for the most part, on the lesser streams.

Prior studies have been carried so far on some of the large rivers, however, that it is expected the reports on these will be available within several months also. One stream of this type is the Tennessee, where exhaustive studies have been made in the accumulation of data bearing on the Muscle Shoals problem. The work on the Sacramento has also been carried a long way toward completion by reason of previous surveys that have been made in connection with flood-control plans.

The Columbia River and its tributaries are regarded as the largest single item of the work from the dual standpoint of reclamation and power development. It has been estimated that the potential power development of which this river is capable is 50 per cent greater than the entire amount of power now developed from the country's streams. Funds totaling $300,000 have been placed in the hands of the district engineers now surveying the Columbia, but a much larger amount will be necessary to complete the work.

When Congress authorized the study an appropriation of $12,322,000 was provided to carry it out. More than seven hundred civilian engineers, fifty army officers and some of the personnel of the Geological Survey, the Coast and Geodetic Survey, the Reclamation Bureau and the Weather Bureau are employed in the study, in addition to the assistance given by state engineers. The work on the Missouri and the Ohio Rivers will be the last to be started, it is stated.

Oklahoma Franchise Elections

One of the most active 30-day periods in the history of Oklahoma, if not the most active, in the number of public utility franchise elections held, ended July 23, according to E. F. McKay, manager Oklahoma Utilities Association. Sixteen franchise elections were held, ten providing for natural gas service, six affecting the furnishing of electricity and one the supplying of water. In three elections municipally owned electric distribution systems were sold to public service companies.

In four elections the vote in favor of the franchise was unanimous. In six there was only one vote in opposition, and in four only two negative votes. The elections reported on electric franchises are as follows: June 27, Glencoe, to Oklahoma Gas & Electric Company; July 2, Cleo Springs, to Oklahoma Gas & Electric Company; July 10, Hastings, to Southwestern Light & Power Company, and sale of electric distribution system ratified; July 16, Hunter, to Oklahoma Gas & Electric Company, including sale of electric distribution system, effective August 1; July 16, Keyes, to Cimarron Utilities Company; July 23, Marland, to Oklahoma Gas & Electric Company, including sale of electric distribution system, effective August 1.

Georgia Rejects Sales Tax

By a vote of 96 to 91 the Georgia House of Representatives voted to table the general sales tax measure and devote its attention to the passage of an income tax bill, which is a companion measure.

The bill, which would have imposed a tax of 1 mill on all electricity sold in the state, has thus been temporarily put out of the running. If the income tax bill is passed it will automatically remove the sales tax bill from consideration. If the income tax bill fails to pass the sales tax will probably be taken up again, but too late for enactment into law.

Power companies are not yet in the clear, however, as another bill has been introduced which would place a tax of 5 per cent on all business done by public utility corporations in the state, and this will be shortly up for debate.

Electric Welding of Buildings

Pittsfield, Mass., has formally adopted the building code proposed by the American Welding Society, making available the advantages of welding in the construction of buildings in that city.

The use of welding in the erection of buildings has been increasing rapidly during the last few years. The total number of buildings erected in this manner increased 50 per cent during the twelve months ended July 1, 1929.

The first community recognition of the value of welding in new building construction was early this year, when regulations covering the electric welding of buildings were incorporated in the building codes of 38 Southern and Western cities. In each of these the building commissioner may grant permits for the erection of electrically welded steel building frames.

The next large-scale recognition was in the State of Pennsylvania, where the Legislature passed a law which makes welding available in building construction in first-class cities.

St. Louis Company Buys Osage River Project

The Missouri Public Service Commission has granted the application of the Union Electric Light & Power Company of St. Louis, Mo., for authority to purchase the site for its proposed $30,000,000 hydro-electric power dam and plant on the Osage River near Bagnell, Mo. A certificate of convenience and necessity to construct, operate and maintain the dam and power plant has been issued. The site will be purchased from the Missouri Hydro-Electric Power Company of Kansas City, Mo., which about two years ago started preliminary work on the project, but was forced to abandon the work because of financial difficulties.

In its order the commission said: "We find that the construction of this project will be of great economic benefit, not only to the city of St. Louis but to all of the communities along the transmission line and to Miller, Morgan, Camden and Benton counties, which are directly affected by the construction of the dam and power plant."

The bulk of the power that will be generated by the new plant will be furnished to the St. Joseph Lead Company at River Mines, Mo., as that company has contracted for approximately 150,000,000 kw.-hr. a year. This energy must be furnished by 1931.

The Union Electric Light & Power Company plans to complete the new dam and power plant in about two years. Some power from the new plant will be brought into St. Louis.

The Federal Power Commission has granted the Union Electric Light & Power Company a license to purchase the dam site and erect and maintain the Osage River project. The dam and power plant will cost $20,000,000 and the transmission lines and substations required about $10,000,000.

The Union Electric will pay the Missouri Hydro-Electric Power Company $766,939.27 plus interest from May 31, 1929, for the site and preliminary work and $200,000 for preliminary services and promotion fees.

High-Tension Direct-Current Transmission

The Thury system of direct-current transmission at high tension, examples of which are to be found in France and Switzerland, is being considered in connection with the plan for transmitting hydro-electric energy from the Assouan dam in Egypt, a distance of 570 miles.

The reason for considering direct-current transmission is that 300,000 volts can be employed as the operating difference of potential, and yet the insulation need not exceed that required for 150,000 volts to ground, since the middle point will be grounded.

Although nearly all of the original installations of Thury are still operating, no new direct-current transmission lines have been installed for twenty years or

more, three-phase, alternating current having been accepted as standard. Within recent years Brown, Boveri of Baden, Switzerland, proposed a direct-current high-tension transmission line for transmitting hydro-electric energy from Norway to Denmark, but so far nothing has come of the proposal.

Maryland Rates Cut

The Maryland Public Service Commission has ordered a $137,500 annual reduction in electric light and power rates on the Eastern Shore.

The order affects the Eastern Shore Public Service Company of Maryland, a subsidiary of the Eastern Shore Public Service Company of Delaware; the Delmarva Power Company, Vienna, Md., and the Consumers Public Service Company, Crisfield.

The companies are required to file amended schedules of rates with the commission not later than September 15. They are directed "to charge for service in accordance with the amended schedules for all consumption after September, 1929, meter readings."

The records of the commission's investigation showed that "the consolidated income of the three companies, available for return in 1929, which will be derived from Maryland consumers, at present rates, is estimated to be $365,000 and the resulting rate of return to be 11.29 per cent."

Among the towns in which the companies operate are Salisbury, Delmar, Cambridge, Denton, Crisfield, Ocean City, Snow Hill and Federalsburg.

The investigation of the rates, charges, services, property and affairs of the companies was instituted by the commission September 21, 1927.

Dawes Urges San Domingo to Dispose of its Utilities

Private ownership and operation of public utilities is upheld as a matter of policy in the Dawes Commission's report recommending changes in the financial arrangements of the government of San Domingo. Though Ambassador Dawes stipulated in accepting the post of financial adviser that his commission would not discuss policies, the report urges the government to dispose of its public utilities, including nuits in a fair way to return a profit. On this subject the commission said:

It is the experience of the world that public utilities are more efficiently administered and more economically operated by private interests than by government operation, and the commission is convinced that if these public utilities can be sold at a reasonable figure, a very large saving would accrue to the government.

The 1929 deficit for postal, telegraph and telephone and radio service is estimated at $312,762, which is $10,000 less than the 1928 deficit.

But the commission found prospects for expansion of the service, reduction of personnel and other improvements expected to cut down operating costs in the near future.

The Dawes group also noted that $93,000 of the total deficit was incurred in sending government messages, which should be deducted from the gross outlay.

Though light and water companies of San Domingo City and Puerto Plata have recently installed equipment that ought to produce a return, the commission urges they be sold to private interests.

The 1928 deficit for both concerns was $21,000, and 1929 profits are estimated by local officials at $76,000. Moreover, the current year's unfavorable balance was due, the commission finds, to installation of new units and forced dependence on outside power.

With regard to the railroad, the commission suggests that the government continue to own and operate it. The deficit was $47,500 in 1929, and because of changing conditions, including increasing use of automobiles and trucks, prospects are not bright for profits.

Because of the service provided to outlying districts, however, the commission thinks it is the government's duty to furnish this service.

A budget system and civil service are two of the major recommendations for cutting the cost of government and freeing the island from the financial suzerainty of the United States.

Pit-Mouth Stations for Pennsylvania

Philadelphia & Reading Coal & Iron Company Seeks Charters for 33 Utility Companies and Will Also Electrify All Its Anthracite Coal Mines

THE state authorities of Pennsylvania are considering the applications of the Philadelphia & Reading Coal & Iron Company for charters for 33 electric public utility companies in an equal number of communities throughout a section of the state.

Even if the charters should not be granted, the development of electric power at the pit mouth by the Philadelphia & Reading Coal & Iron Company would be carried out, for all the mines of the concern are to be electrified. The electrification of the Reading collieries and the rebuilding of 32 breakers in the anthracite field are now in progress under the supervision of Stone & Webster, who will also have charge of construction for the 33 Reading public utility companies as and if chartered. So far as construction is concerned, the two projects are entirely separate.

Reading Coal & Iron was refinanced some months ago. New capital to the extent of $30,800,000 was provided. It is this money which will be expended in the new building program. This was the first real step, according to fuel engineers, taken in the rehabilitation of the anthracite industry.

Many of the 90 breakers of the company were built as far back as 1890 and are antiquated. When the coal company was ordered segregated from the Reading Railroad by the courts, the former did not have funds with which to keep equipment up to the best level.

The electrification of the mines, it is claimed, will cheapen the production of coal. It will permit also the utilization of the lower grades of coal which are not commercially marketable. The capacity of the generating plants will be huge and the 33 public utility companies can be supplied with electricity produced from what is now practically a waste product, thus adding materially to the revenue of the coal company.

While the Reading company has been reticent as to its plans, pending action on applications for charters, it is known that the concern has not planned to invade Philadelphia and nearby cities. These communities are already well covered by the Philadelphia Electric Company, with its huge hydro-electric power plant at Conowingo on the Susquehanna River.

It would be thoroughly practical, however, for the transmission lines of Reading Coal & Iron to be hooked up in a big chain of superpower which would cover no small portion of the industrial mid-Atlantic territory. The Reading Coal Power concerns are not expected to set up competition to the local companies already operating in the territory it has selected. It will endeavor instead to sell electricity wholesale to such companies. It expects to be able to sell current in large quantities lower than it costs the local companies to generate it.

Reading Coal cannot, of course, put a power plant at every colliery, for it must choose sites where sufficient flow of water for condensation purposes is available. One such point will be Herndon, on the Susquehanna River.

Alabama Rate Cuts Suggested

Recommendation that commercial lighting, street lighting and wholesale power rates of the Alabama Power Company be simplified are made in a report to the Alabama Public Service Commission by I. F. McDonnell, chief engineer for the commission. The modified rate schedule as recommended would mean a reduction of $484,000 a year in the revenues of the company. The commission has asked the Alabama Power Company to file any exceptions to the engineer's report with the commission within the next three weeks. Mr. McDonnell asks that the number of rate schedules of the power company be reduced from more than 40 to 16 and that they be made applicable to every section of the state.

The chart submitted by the engineer shows that consumers of electricity for commercial lighting would benefit to the extent of $382,000 annually; municipalities would save $36,000 a year in their street lighting bill, while wholesale power users would save $66,000 per year.

Georgia Mayors Form Rate Association

The Municipal Utilities Rate Association of Georgia has just been formed here by the mayors and other city officials from leading municipalities of the state "to protect the interest of gas and electric consumers."

W. M. Lester, attorney and City Council member of Augusta, was named permanent chairman of the association, with authority to appoint a secretary. O. W. Franklin, city attorney of Valdosta; James A. Fort, Mayor of Americus, and William de L. Worsley, city attorney of Columbus, were appointed a committee to draw up a constitution and by-laws. Mayor I. N. Ragsdale of Atlanta; L. V. Bean, city manager of Waycross; E. R. Layfield, chairman of the public utilities committee of the Macon City Council; John J. Bouhan, city attorney of Savannah, and W. B. Bell, Mayor of Augusta, were appointed to serve as a governing board of the new association.

Those attending the meeting voted to indorse the measure pending in the state legislature calling for the appointment of a special committee to study the public utilities situation in the state.

Hydro-Electric Development on Connecticut River

Construction is progressing rapidly on the 185,000-hp. lower Fifteen-Mile Falls hydro-electric development of the New England Power Association. The development is on the Connecticut River in northern Vermont and New Hampshire and is claimed to be the largest hydro-electric development in the New England States. It is expected that the plant will be in operation by October, 1930.

This lower development is the first of two adjacent water-power sites to be developed by the New England Power Association to meet the rapidly increasing demands for electricity in its territory. The two developments, 8 miles apart, will have a combined rating of about 300,000 hp. The dam at the upper development will also create a large reservoir for the regulation of the Connecticut River, benefiting not only the Fifteen-Mile Falls plants but also the plants of the association now in operation downstream at Bellows Falls and Vernon.

When the lower Fifteen-Mile Falls development is completed the International Hydro-Electric System will have hydro-electric plants in the United States and Canada of an aggregate capacity of 1,037,100 hp. installed and in operation. More than 800,000 additional hydro-electric horsepower, as yet undeveloped, is available to satisfy the continually growing power requirements of the areas served by it in New England and eastern Canada. Supplementing this hydro supply, the system has 477,500 hp. in the steam-electric plants of its New England Power Association.

Briefer News

EXPANSION AT BRUNSWICK, GA.—Work has been started by the Georgia Power Company on a new power plant at Brunswick. Several new buildings will be constructed and extensive remodeling and enlarging will be done to provide for the new equipment to be installed. The plant will be completed about January 1.

NEW 110-KV. LINE FROM BUFFALO TO LOCKPORT, N. Y.—Materials have been ordered for the construction of a 110-kv. transmission line which will connect Lockport, N. Y., with the Charles R. Huntley station in Buffalo. This line will make it possible to interchange steam and hydro power between the Buffalo General Electric and Niagara, Lockport & Ontario systems and will greatly increase transformer facilities.

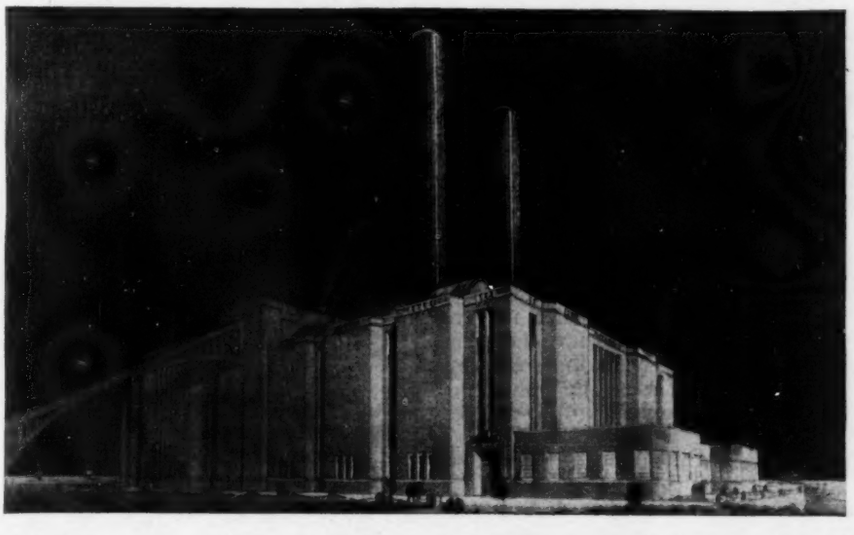
INTERNATIONAL CONGRESS OF TECHNICAL PRESS AT BARCELONA.—An "international congress of the technical and professional press" will be held at Barcelona, Spain, from September 16 to 24, with excursions to Madrid, Seville, Toledo and elsewhere, sightseeing occupying a large part of the time. Group sections and international commissions will function as part of the congress and deal with organization, statistics, postal matters, economical and juridical relations, and advertising.

OREGON LIGHT AND POWER COMPANIES GIVING UP GAS INTERESTS.—Electrical operators in Oregon are gradually disposing of joint gas holdings and devoting their activities to the business of generating and selling energy. The last electric utility to abandon the gas industry is the Portland Electric Power Company. This concern sold its interest in the gas utility serving the city of Salem to the Portland Gas & Coke Company. Among other electric companies in Oregon getting out of the gas business is the Mountain States Power Company of Albany. This utility is now negotiating for the sale of all of its gas properties.

LARGE CONSUMERS OF POWER IN NEW YORK CITY GET RATE REDUCTION.—An amended electric rate tariff for Manhattan and Bronx Boroughs, New York City, has been approved by the Public Service Commission and will result in a material reduction for 35 per cent of the large consumers in those boroughs. The rate consists of a demand charge of $2.50 per kilowatt per month for the first 300 kw. of maximum demand and $1.50 for the excess, plus an energy charge of 2½ cents a kilowatt-hour for the first 12,500 kw.-hr., 2 cents for the next 50,000 kw.-hr., 1½ cents for the next 50,000 kw.-hr., 1 cent for the next 50,000 kw.-hr. and 0.9 cent for all over 162,500 kw.-hr. per month, subject to coal cost adjustment clause

TO PRODUCE 1,500,000 HP. OF HYDRO POWER IN ALSACE — According to Frederic Lamay, consulting engineer and general manager of the Société Alsacienne de Constructions Mécaniques now on an extensive trip through the United States and Canada to gather data on power developments, huge hydro-electric plants are to be built in Alsace, France, coincidentally with the construction of a canal parallel to the Rhine from Basle, on the Swiss border, to Strasbourg. These plants will produce 1,500,000 hp. through ten power units of a capacity of 150,000 hp. each. The electricity developed will be used in

Coming Generating Plant at Michigan City, Ind.



ABOVE is an architect's drawing of the 68,000-kw. steam-electric generating station to be erected on the lake front at Michigan City, Ind., as reported in the ELECTRICAL WORLD for June 29 (page 1348). The plant will take about two years to build and will involve an expenditure of $9,000,000.

Alsace by its big industries and the high-tension current will be transmitted to Paris. The first plant of the series is now being built at Kembs and will be completed in about three years. The enterprise is being carried on by the Rhine Hydro-Electric Power Company of Mulhouse, which is capitalized at 250,000,000 francs.

THREATENED WATER SHORTAGE IN OREGON.—A probable water shortage in Oregon is predicted, rivers and streams in every section of the state being reported by the state engineer to be at an extremely low level. With a great increase in demand for irrigation, water for power purposes has been reduced to the minimum, and hydro-electric operators have had to fall back on all the auxiliary facilities available. Some state officials maintain that climatic changes since 1924 are bringing a lower stage each coming summer. Project managers are doing their utmost to conserve existing supplies, and it is hoped that careful consumption of water will prevent damage.

WANTS TO UNDERTAKE HYDRO DEVELOPMENT ON OREGON WATERS.—Laurence Macomber of Los Angeles has filed two applications with the Oregon State Engineer, one for a permit to appropriate 400 sec.-ft of water from Salmon Creek, tributary of the Willamette River, for power development, and another for a permit to store 150,000 acre-feet of water from Waldo Lake and to appropriate such stored water at the rate of 200 cu.ft. a second for the development of 70,500 hp.

ABERDEEN, WASH., STILL CONTEMPLATES MUNICIPAL SYSTEM.—A comprehensive plan for the development of a municipal power system for Aberdeen, Wash., is indicated in a recent announcement by city officials. The city will buy the power and resell to consumers, four sources being under consideration. All plans call also for construction of a hydro-electric plant on the Upper Wynoochee River. Officials state that the first unit of a projected five-million-dollar plant can be built well within the limit of $2,000,000 set in a bond issue favored by city voters several years ago.

NEW 86-MILE 66-KV. LINE FOR CENTRAL POWER & LIGHT COMPANY.—The Central Power & Light Company of San Antonio, Tex., will connect its generating plant at Laredo with other generating stations in south and southwest Texas, putting Laredo on the trunk transmission line extending through the Winter Garden and the Hill Country to San Angelo, Del Rio and San Antonio. A 66,000-volt line, approximately 86 miles long, between Laredo and Asherton, via Encinal, will give service to that community and surrounding territory. It is anticipated that this line will be in service by the middle of October. A substation will be erected in Laredo in the northwest section of the city, and new equipment will be installed in the generating station. The substation at Asherton will be enlarged, and Asherton will become the junction point of three lines which will bring power into the Winter Garden area from five sources—Del Rio, Uvalde, Laredo, interconnection with the West Texas Utilities Company and interconnection with the San Antonio Public Service Company. The company will also build a 66,000-volt line from Uvalde northward to the north boundary of Edwards County. At this point the line will connect with one to be built by the West Texas Utilities Company which will complete the connection with San Angelo.

Coming Meetings

[A complete directory of electrical associations, with their secretaries, is published in the first issue of every volume. For latest list see issue of July 6, page 46.]

International Association of Municipal Electricians—Statler Hotel, Boston, Aug. 20-24. H. N. Lang, box 1864, Orlando, Fla.

International Association of Electrical Inspectors, Western Section—Book-Cadillac Hotel, Detroit, Aug. 26-28. W. S. Boyd, 175 W. Jackson Blvd., Chicago. International convention, Vancouver, B. C., Canada, Sept. 9-11. F. D. Weber, P.O. box 745, Portland, Ore.

National Association of Railroad and Utilities Commissioners—Glacier National Park, Mont., Aug. 27-30. J. B. Walker, 270 Madison Ave., New York.

Rocky Mountain Division, N.E.L.A.—Hotel Colorado, Glenwood Springs, Colo., Sept. 2-4. O. A. Weller, Public Service Co. of Colorado, Denver.

Colorado Utilities Association—Glenwood Springs, Colo., Sept. 2-4. O. A. Weller, Public Service Co. of Colorado, Denver.

American Institute of Electrical Engineers — Pacific Coast convention, Santa Monica, Calif., Sept. 3-6. F. L. Hutchinson, 33 West 39th St., New York.

Pennsylvania Electric Association—Bedford Springs Hotel, Bedford Springs, Pa., Sept. 4-6. H. A. Buch, Telegraph Building, Harrisburg, Pa.

Association of Edison Illuminating Companies—Chateau Frontenac, Quebec, Sept. 9-12. P. S. Millar, 80th St. and East End Ave., New York.

New England Division, N.E.L.A. — Hotel Griswold, New London, Conn., Sept. 9-12. Miss O. A. Bursiel, 20 Providence St., Boston.

Empire State Gas and Electric Association—Saranac Inn, Saranac Lake, N. Y., Sept. 19-20. C. H. B. Chapin, Grand Central Terminal, New York.

American Electrochemical Society — Hotel William Penn, Pittsburgh, Sept. 19-21. C. G. Fink, Columbia University, New York.

Illuminating Engineering Society — Bellevue-Stratford, Philadelphia, Sept. 24-27. A. B. Oday, 29 West 39th St., New York.

Great Lakes Division, N.E.L.A. — French Lick Springs, Ind., Sept. 26-28. T. C. Polk, room 110, 140 South Dearborn St., Chicago.

American Electric Railway Association —Atlantic City, Sept. 30-Oct. 4. J. W. Welsh, 292 Madison Ave., New York.

Association of Electragists International—New Ocean House, Swampscott, Mass., Sept. 30-Oct. 3. L. W. Davis, 420 Lexington Ave., New York.

National Safety Council — Stevens Hotel, Chicago, Sept. 30-Oct. 4. W. H. Cameron, 108 East Ohio St., Chicago.

National Electrical Manufacturers' Association—Wardman Park Hotel, Washington, Oct. 7-11. S. N. Clarkson, 420 Lexington Ave., New York.

POWER FOR TOWN ON BRITISH COLUMBIA-ALASKA BOUNDARY. Development of 2,000 hp. as the initial stage in a program to treble this amount during the next three years has been commenced at American Creek, British Columbia, by the Northern British Columbia Power Corporation, a subsidiary of the Canada Power Corporation. Stewart, situated on the Alaska and British Columbia boundary, will provide the main market for this power. Mines in the vicinity will also be supplied with light and power.

OKLAHOMA CAPITOL FLOODLIGHTING MADE COMPLETE.—The floodlighting installation at the State Capitol in Oklahoma City on which the south side of the structure was illuminated some months ago has been made complete by the installation of a battery of lights to illuminate the north side also. Most tourists passing through this city see only the north side of the building, which now presents a beautiful spectacle when approached from any direction.

WALLOWA FALLS PLANT TO BE SUPPLEMENTED.—The Pacific Power & Light Company, Portland, Ore., is planning to build a hydro-electric power plant at Joseph, Ore., on the site of an old plant which was part of the system of the Enterprise Electric Company when that property was acquired by the Pacific Power & Light. The new building will be of brick and will house a 1,500-hp. Pelton wheel direct-connected to a 1,250-kva., 2,200-volt generator. Water will be conducted to the plant by a 48-in. wooden-stave pipe line a little more than a mile in length. It is planned to have the plant ready for operation before the end of the present year, as it is badly needed to supplement the Wallowa Falls plant.

WEST KOOTENAY POWER & LIGHT COMPANY PLANS EXPANSION.—Plans for extending the operations of the West Kootenay Power & Light Company far outside their present radius in British Columbia to embrace the Adams River, east of Kamloops, and generate 25,000 hp. to supply mines near Princeton have been announced. The company is also now ready to proceed with its long-talked-of dam at Granite, on Kootenay Lake, which was once discussed before the International Joint Commission on boundary waters. The dam would affect the level, both of the lake, a navigable water, and of the Kootenay River, which runs through Idaho before entering the lake. Thus both the Dominion and the United States must sanction it. The dam would add greatly to the output of the West Kootenay company's power plant at Bonnington, which now has a maximum capacity of 150,000 hp. The company has still another project

in hand—the harnessing of the Pend Oreille River, near the United States boundary, where its plans call for an initial development of 80,000 hp. and an ultimate development of 120,000 hp.

COMING INSTITUTE MEETINGS.—The Pacific Coast convention of the American Institute of Electrical Engineers, to be held at Santa Monica, Calif., September 3-6, will be followed by a district meeting at Chicago on December 2-4. Meetings for 1930 already arranged include the annual winter convention at New York, January 27-31; the annual summer convention, to be held next year at Toronto, June 23-27, and a district meeting at Springfield, Mass., May 7-10.

NEW SUBSTATIONS FOR TORONTO PROJECTED.—It is reported that the Hydro-Electric Power Commission of Toronto intends to proceed with the construction at an early date of two new power substations at a cost, including equipment, of approximately $1,300,000. This is part of an extension program approved by the City Council at the beginning of the year. One of the new stations will be located in North Toronto and the other on Queen Street East. Both are to be connected with the Leaside-Gatineau stepping-down station.

WATER-POWER RESOURCES OF WYNOOCHE RIVER BASIN, WASH. — The water-power resources of the Wynooche River Basin, on the Olympic Peninsula, Wash., amount to 35,800 hp. for 90 per cent of the time and 45,600 hp. for 50 per cent of the time, provided that the flow shall be regulated at three proposed storage reservoirs, according to Edward E. Jones, hydraulic engineer of the Geological Survey. Without regulation the potential power amounts to 9,330 hp. for 90 per cent of the time and 39,100 hp. for 50 per cent of the time.

CHATTAHOOCHEE RIVER DEVELOPMENT PLANS.—The tentative approval given by the Federal Power Commission for a ten-million-dollar hydro-electric plant on the Chattahoochee River, near West Point Ga., to be constructed by the West Point Manufacturing Company, calls for two dams—one about a mile above West Point and the other 8 miles up the river. The upper dam, which will be on Wehdkee Creek, will be 52 ft. high, and the lower one, on Oseligee Creek, will be 18 ft. high. The area flooded will be approximately 40,000 acres and will extend for 38 miles above the upper dam up to Franklin, Ga., where the Georgia Power Company has an undeveloped dam site. About 10,000 hp. will be developed, largely for use in the mills of the West Point Manufacturing Company.

GROWTH OF ALLIANCE (OHIO) PLANT.—The Suburban Light & Power Company of Alliance, Ohio, will spend more than half a million dollars in an expansion and rehabilitation program, according to the announcement of company officials. To increase the capacity of the Alliance power plant $400,000 is being spent, as before reported. This work has been in progress for several months. A 15,000-kva. turbo-generator and a boiler have been installed with auxiliary equipment. At Lake Milton, north of Alliance, the company has contracted for the erection of two large steel towers, one on each side of the lake. The present 6,900-volt line attached to the Lake Milton bridge will be removed and a 23,000-volt system installed. Larger equipment is being installed at Lake Milton, Lost Creek, Ada and Utica, while the lines are being extended in the Lake Milton district. The company also is rebuilding its lines over a 24-mile route near Waldo.

Recent Court Decisions

COMMISSION MUST FIND NECESSITY FOR AN ORDER TO UTILITY TO INCREASE SUPPLY; NEED CANNOT BE INFERRED.—The Supreme Court of Vermont has upset an order of the Vermont Public Service Commission (Trustees of Newport Center vs. Niles) ordering a water company to obtain an additional source of supply as fatally defective in that the commission did not find such further source reasonably necessary to supply the company's customers. Such a finding, the court held, cannot be inferred from the facts reported, and nothing in favor of commission jurisdiction can be presumed. (146 At. 71.)

NEBRASKA HYDRO-ELECTRIC DISTRICT LAW UNCONSTITUTIONAL.—The Nebraska Supreme Court has declared unconstitutional the law passed at the 1927 session authorizing the creation of hydro-electric districts by municipalities or rural units, in combination or separately, on the ground that the Legislature sought therein to delegate legislative powers to the courts by directing them to pass on questions of public policy, convenience and welfare as related to the organization, incorporation, boundaries, powers and government of these districts. It holds that these are in the first instance of purely legislative cognizance and may not be referred to the courts for determination. The constitution does not vest in the courts any power to adjudicate upon the necessity or political propriety of forming such corporations, and the Legislature may vest in it only the duty and power of determining whether or not the law has been complied with, as a condition upon which such organization shall come into being. The court holds that as the law imposed on the courts the duty of determining from the evidence whether or not the district should be incorporated, whether the suggested boundaries are reasonable, proper and necessary for the public convenience and welfare, and gave it power to change or alter boundary lines with that object in view, the fact that it was later to submit the proposal in the form of a tax levy to the voters will not save the act, for the Legislature is equally powerless to delegate its power to any individual or group of individuals when the questions are purely political and legislative in their nature. In anticipation of a possible adverse decision, the last Legislature amended the 1927 law, but an inspection of the new statute, which was to have become effective July 24, shows that it confers the identical powers on the courts that the Supreme Court judges found to make invalid the old law.

*The left-hand numbers refer to the volume and the right-hand numbers to the page of the National Reporter System.

TEXAS MUNICIPALITY'S RIGHT TO BUILD AND OPERATE PLANTS CANNOT BE CONTRACTED AWAY.—Declaring that the right of cities and towns in Texas to build and operate light and water systems cannot be contracted away, the Circuit Court of Appeals, Fifth District, in Fairbanks, Morse & Company vs. Texas Power & Light Company, held that the plaintiff was entitled to enter into a contract with the city of Commerce for the erection of an electric power plant and distribution system, notwithstanding an existing contract between the defendant and the city whereby the defendant was to furnish the city with electrical energy for operating its waterworks and street-lighting system. The plaintiff could solicit customers of the defendant (operating under contracts calling for energy for yearly periods with privilege of renewal) to enter into new contracts on lawful termination of existing ones. The same finding was made by the District Court in a suit brought by the same firm against the Texas Electric Service Company. (32 Fed. [2d] 693 and 696.)

Commission Rulings

DEDUCTION FOR DEPRECIATION AN ESSENTIAL IN RATE VALUATION.—Premising that original or historical cost, reproduction cost new, reproduction cost less depreciation, service available, service furnished and all other elements affecting the value of utility property should be considered in fixing and determining value for rate making, the Idaho Public Utilities Commission, in fixing rates for the Teton Valley Power & Milling Company, insisted that the fact that a portion of the original plant and certain portions of the transmission and distribution systems of the utility had been in almost constant use for fifteen years must be taken into account in arriving at the present fair value of the property and such depreciation determined as may be found to be fair and equitable.

FINDING OF FAIR VALUE NOT ALWAYS NECESSARY IN VALUATION.—Denying a petition for a rehearing in a rate case affecting the city of Pittsburgh and the Equitable Gas Company, the Pennsylvania Public Service Commission said, contradicting a contention by the city, that a finding of fair value is not necessary in every case involving the fixing of rates, provided that the record and the report of the commission support the conclusion that some reasonably scientific method of arriving at the decision has been used. The commission added that where a finding of fair value is not necessary or useful in arriving at such conclusions it may be dispensed with.

News About Men of the Industry

Harold Smith Elected Westinghouse Vice-President

At a meeting of the board of directors of the Westinghouse Electric & Manufacturing Company held in New York July 31, Harold Smith, general solicitor of the company, was elected vice-president, with offices in that city. Mr. Smith entered the legal department of the Westinghouse company in 1919 and was appointed general solicitor in 1926. Prior to that time he was engaged in the practice of law in Chicago, being a member of the firm of Glennon, Cary & Walker. He is a graduate of Northwestern University (L.L.B. in 1905), and of Yale (L.L.M. in 1906), and he also studied at the University of Chicago. He is a member of the bar of the states of New York and Illinois.

FRANK P. JONES has resigned as president of the Beauharnois Light, Heat & Power Company, according to an announcement made following a recent meeting of the Beauharnois Power Syndicate.

WALTER H. KELLY has been made manager of the industrial development department of the West Penn Power Company to succeed E. B. Glazier, resigned. Mr. Kelly has been connected with the company since 1920, mainly in an engineering capacity.

C. G. EICHELBERGER has been appointed assistant to H. C. Blackwell, president of the Union Gas & Electric Company. Mr. Eichelberger has been connected with the company since 1913 as engineer and power sales engineer and more recently he has had charge of gas and electric rates. He was formerly connected with the Columbus Railway, Power & Light Company of Columbus, Ohio.

WILLIAM D. BREED, formerly of Cincinnati, has been elected vice-president of the W. B. Foshay Company, Minneapolis, and a member of the executive department of the company. He is secretary of the Crane & Breed Manufacturing Company, member of Elliott, York & Breed of New York, and a director of the Haytian Corporation of America. Mr. Breed is a graduate of Sheffield Scientific School.

WILLIS W. DAWLEY has been appointed manager of the Lake Erie Light & Power Company, Green Springs, Ohio, with supervision of all rural lines connecting Fremont, Clyde and Green Springs. He was one of the committee of three appointed by the Chamber of Commerce which was instrumental in procuring light and power for Green Springs, twelve years ago, serving as supervisor of purchase and construction work and also on the board of directors. Mr. Dawley has been employed 28 years by the Green Springs Telephone & Electric Company. He has resigned from the telephone work to accept his new position.

P. S. Arkwright Heads Georgia Utility

Preston S. Arkwright, president of the Georgia Power Company, has been elected president and a member of the board of directors of the Columbus Electric & Power Company, Columbus, Ga. In addition to Mr. Arkwright, the following officers were selected by the board of directors: W. E. Mitchell, Atlanta; R. M. Harding, Columbus; C. A. Bingham, New York, and F. P. Cummings, New York, were elected vice-presidents. W. H. Wright, Atlanta, was elected secretary and I. S. Mitchell, Atlanta, was elected treasurer.

M. E. SKINNER, vice-president of the Mohawk-Hudson Power Corporation, has been named regional director of district 3 in the national food preservation program.

R. O. MCMURTRY, director of the Canadian General Finance Company, London, has been elected a director of the Mexican Light & Power Company and the Mexican Tramways Company.

DANIEL J. DE COURCY has been made superintendent of distribution of the Lawrence Gas & Electric Company, Lawrence, Mass.

R. H. BALLARD, president of the Southern California Edison Company, who has been convalescing in Europe from his recent illness, sailed from Cherbourg August 3 on the *Empress of Australia* for Quebec. Mr. Ballard will visit Toronto, Chicago and other cities en route to Los Angeles.

RALPH E. JUMP has been made assistant to James E. Jordan, superintendent of distribution for the El Paso (Tex.) Electric Company. In addition to his new duties Mr. Jump has direct supervision over the dispatch division and also will continue his work as safety engineer.

WALTER A. BUCHANAN, general superintendent of the Huntington division of the Appalachian Electric Power Company, has been promoted to the position of general manager of the Welch (W. Va.) district of the company. Mr. Buchanan succeeds B. P. Rouse, whose resignation as local manager was recently announced.

D. E. Peck New General Electric Vice-President

Darius E. Peck, assistant manager of the law department of the General Electric Company since 1920, was elected vice-president and general counsel of the company at a meeting of the board of directors in New York August 1. At the same time President Gerard Swope announced the retirement of Allen H. Jackson, who has been vice-president and general counsel since 1922 and associated in the company's law department since 1902. The meeting of the board was held on the *Viking*, the new 263-ft. yacht of George F. Baker, Jr., a member of the board.

Mr. Peck practiced law in New York City from 1902 until 1913, when he became a member of the law department of the General Electric Company and moved to Schenectady. Seven years later he was named assistant manager of the department, a position he held until his promotion to vice-president and general counsel. He has also had considerable experience in the public utility field. In 1915 he was elected secretary, treasurer and a director of the Schenectady Illuminating Company, the Mohawk Gas Company and the Schenectady Power Company, succeeding James O. Carr. In 1920, at the time of the organization of the Adirondack Power & Light Corporation he was elected a director and secretary and served for several years. When the Mohawk-Hudson Power Corporation was formed in 1925 he became secretary of that company, serving until April of this year. He is at present a director of the New York Power & Light Corporation.

In 1900 Mr. Jackson had his first contact with General Electric affairs, previous to his actual entry into the company's organization. It was at this period that the National Electric Lamp Association was undergoing organization at Cleveland. At the request of the late Hinsdill Parsons, general counsel of the General Electric Company, Mr. Jackson went to Cleveland upon a number of occasions in connection with this matter and assisted in bringing about the formation of the national association. His work at that time was a forerunner to his direct employment by the General Electric Company in December, 1902, as one of its attorneys, under Mr. Parsons. Mr. Jackson became counsel to the company in 1911, and after Mr. Parsons' death, in 1912, he became the head of the law department. In 1922, the year in which Gerard Swope succeeded E. W. Rice,

Jr., as president of the company and Owen D. Young succeeded the late Charles A. Coffin as chairman of the board, Mr. Jackson was appointed vice-president and general counsel.

S. G. Meek Resigns

S. G. Meek, manager of the electrical department of the Johns-Manville Corporation, New York, for many years, tendered his resignation as of July 1. Mr. Meek's experience in the electrical world dates back from the early days of the street railway and the light and power industry and in the course of his career he has been connected with numerous products and accessories which the Johns-Manville Corporation have manufactured and sold. He was one of the early pioneers in advancing the sale of "Noark" fuse protection, as well as fiber conduit, and the many insulating materials manufactured by this company, such as ebony asbestos wood transite and other materials. He also was closely identified with the pioneer selling of electrotherms, the electric heating pad, which today are sold in millions throughout the country.

Mr. Meek was well known in engineering circles throughout the country, and while his many friends rejoice in the fact that he is physically able to enjoy a long-needed vacation, they regret that he has stepped out of active participation in the industry's affairs. In presenting to Mr. Meek a watch, the gift of his fellow associates, the vice-president of the company said that Mr. Meek had been one of the foundation stones which had helped to erect and support the structure of the Johns-Manville Corporation.

H. W. Young, president of the Delta-Star Electric Company, Chicago, returned to this country August 6 aboard the *Olympic* after spending two months in Europe. While abroad Mr. Young visited France, Germany and England.

W. J. Beck, for nineteen years director of research of the American Rolling Mill Company, has been appointed assistant to Charles R. Hook, general manager. Graduating from Purdue University in 1896, Mr. Beck was for several years an electrical engineer with the Westinghouse Electric Company. He has had considerable practical engineering experience, his early work being of that nature, with emphasis on electrical engineering. He joined the American Rolling Mill Company 26 years ago as superintendent of the electrical department and in 1910 was appointed director of research. Mr. Beck has had close contact with the manufacture of electrical machinery, motors, generators, transformer and radio equipment and has made a detailed study of the characteristics of iron and steel for magnetic purposes. He is a member of the American Electrochemical Society, American Institute of Mining and Metallurgical Engineers, American Society for Steel Treating, American Society for Testing Materials, British Institute of Metals, British Iron and Steel Institute, Engineering Society of Western Pennsylvania, Iron and Steel Institute of Germany and West of Scotland Iron and Steel Institute.

Kenneth E. Kratz, formerly connected with the Commonwealth Power Corporation at Jackson, Mich., is now affiliated with the Muskegon district of the company in the capacity of distribution engineer.

B. C. Cobb of New York, chairman of the board of directors of the Commonwealth & Southern Corporation, was elected a director of the Georgia Power Company at the regular meeting of directors, held July 30, to succeed the late George E. Patterson of Macon, Ga. Mr. Cobb's connection with the Georgia Power Company is by no means his first in the South, as he is president of the Tennessee Electric Power Company and a director of the Nashville Railway & Light Company. In addition he is president of the Commonwealth Power Company and the Penn-Ohio Edison Company, chairman of the board of the Allied Power & Light Corporation, a member of the public policy committee of the National Electric Light Association and for three years served as chairman of the advisory council of the A.E.R.A.

Dr. Anson Hayes has been appointed director of research of the American Rolling Mill Company, Middletown, Ohio, in charge of all metallurgical research problems for this organization. For the past year and a half Dr. Hayes, has been chief of the chemical division of the Armco research division. Before joining the American Rolling Mill Company he held the chair of physical chemistry at Iowa State College for twelve years and headed that division of the large chemical department of that institution. He also taught graduate courses in thermo-dynamics and directed research work in the study of factors that influence the stability of iron carbide. Dr. Hayes is a member of the American Chemical Society, American Electrochemical Society, the American Society for Testing Materials and American Society for Steel Treating.

W. M. Shepard, since 1924 vice-president and general agent of the California Oregon Power Company, has resigned to accept a position with the American & Foreign Power Company in Buenos Aires, Argentina. He began his career in the electrical industry with the General Electric Company, first at Schenectady and later at the Atlanta office, leaving there to go to the San Francisco office. In that branch he was first supply salesman, then apparatus salesman and finally special agent handling central station, industrial and mining business in northern California and southern Oregon. In 1916 he left the General Electric Company to become commercial manager of the California Oregon Power Company. Two years later he was made general agent of that company. The further promotion to a vice-presidency same in 1924, and in 1926 he was elected to the board of directors.

Obituary

Armistead K. Baylor

Armistead K. Baylor, aged 61, General Electric commercial engineer and veteran of the electrical industry, died suddenly early on the morning of August 1 at Ipswich, Mass., where he was summering. In 1891 Mr. Baylor went with the Thomson-Houston Electric Company at West Lynn, Mass., and moved to Schenectady, N. Y., in 1894 when the headquarters and main offices of the General Electric Company were established there. In 1896 he went abroad to become manager of the traction department of the British Thomson-Houston Company, becoming general sales manager there. After fourteen years he returned to this country to re-enter the General Electric organization, and for several years was in the commercial general department. Mr. Baylor was also vice-president, director and a member of the executive committee of the Edison Electric Appliance Company. In addition he served on the directorate of the Electric Vacuum Cleaner Company and the Contract Purchase Corporation. He was a member of the American Institute of Electrical Engineers and of the Institution of Electrical Engineers (Great Britain).

Charles H. Ingalls, for many years meter engineer of the Edison Electric Illuminating Company of Boston, Mass., and one of the most eminent specialists in this field in the utility industry, died suddenly on August 4 at Rockport, Mass. Mr. Ingalls was born at Danvers, Mass., 56 years ago, was educated at the Massachusetts Institute of Technology and entered the employ of the Edison company in 1896, the year of his graduation. He was active for many years in the work of the N.E.L.A., and had held many responsible committee posts in connection with electrical measurement engineering. Under his direction were installed the extensive facilities for multiple testing of meters by automatic methods at the general service buildings of the Edison company which have attracted the admiration of meter specialists from all over the world.

Financial and Statistical News

ANOTHER temporary adjustment in the over-rapid upswing of utility prices seems to be the week's market story. The phenomenal rise of a group of Middle Western stocks recently could hardly escape this week's sequel, sooner or later. It came quickly and resulted in a substantial decline in average prices on all exchanges.

——MONEY RATES APPEAR TO HAVE PLAYED A SMALL PART in the week's corrective movement. The week opened strong despite tight money. The Chicago flurry was necessary to start the selling. The sudden drop from 12 to 8 per cent for call money, ascribed by dealers largely to slackness of demand, had no very material effect. Mob instinct seems exceedingly prevalent in current market operations and buying movements have become more or less independent of the money market.

Boston Edison Plans to Split Stock

Directors of the Edison Electric Illuminating Company of Boston at a meeting held August 1 voted to call a special meeting of stockholders for August 23 to authorize a change in capitalization by issuing four shares of new stock of $25 par value for each share of old held. The present par value of the stock is $100. The proposed action is subject to the approval of the Department of Public Utilities. The directors also authorized the sale at public auction of 1,000 shares of capital stock which was also authorized by the Department of Public Utilities. This stock will be offered August 14.

The sale of these additional shares will increase the number of outstanding shares to 534,875, and if the stockholders approve the proposed change in par value the stock will be increased to 2,139,500 shares.

Real Cost Determined by Average Rate

That the real cost of power is determined by the average rate rather than by the domestic rate alone is argued by the Montreal Light, Heat & Power Company in a bulletin sent out with the current quarterly dividend check to shareholders. The bulletin contains the following interesting argument:

Comparisons are frequently made of individual rates for electricity in various cities—to no good purpose, we think. For example, the rate for domestic electric service in Toronto is often invoked in comparison with the rate for the same class of service in Montreal.

The selling price of electricity in any community may be accurately gaged only by the average selling price for all electricity sold for domestic, industrial and public utility purposes; the average selling price is the unit which is distributed over the whole population and permeates the entire community as opposed to individual rates often made for political effect or expediency to benefit one class of consumers.

Our gross revenue from the sale of electricity during 1928 (excluding export power) was equal to 1.39 cents per kilowatt-hour, while the gross revenue of the Toronto Hydro-Electric Commission during the same period was equal to 1.57 cents per kilowatt-hour. Notwithstanding the lower average rate in Montreal, it is significant that we (or rather our consumers) had to pay upward of $700,000 per annum included in our rate for federal income tax, not to mention provincial and municipal taxes, whereas the Toronto Hydro-Electric Commission had no income tax or other taxes to pay.

New England Power Association Output Up

The New England Power Association, controlled by International Hydro-Electric System, a division of International Paper & Power Company, produced 137,688,000 kw.-hr. of electric energy in June, an increase of 25 per cent over the output of the association in June, 1928, and 61 per cent over that of June, 1927. In the first six months of this year the output of New England Power Association was 859,906,000 kw.-hr., 30 per cent greater than in the corresponding period of 1928 and 64 per cent greater than in the first six months of 1927.

Shawinigan Utility Reports Successful Year

Electric power production by the Shawinigan Water & Power Company, Shawinigan Falls, Que., so far this year has shown an increase of 20 per cent over the corresponding period of 1928. Electric energy produced by the company is running at a rate in excess of 10,000,000 kw.-hr. a day. Last year the company sold 3,067,830,706 kw.-hr. of electric energy, including 2,487,222,687 of primary power and 580,608,019 of secondary power. This was an increase over 1927 of approximately 14 per cent.

The most encouraging feature in Shawinigan's development this year is the growth of Shawinigan Chemicals, Limited, a wholly owned subsidiary. Formed early last year as a merger of Canada Carbide, Limited, and Canadian Electro Products Company, Ltd., the present company has been steadily expanding until it now occupies an important position in the chemical industry.

America's New Frontier

"America's New Frontier" is the caption of a booklet recently published by the Middle West Utilities Company, dealing with the gradual decentralization of industry and the wider geographical spread of industrial activities, accompanied by a more general diffusion of wealth and good living throughout the land due to electricity.

One of the interesting statements made in the booklet is that the 45,500,000 or more Americans in gainful occupations today include the equivalent of the working force of between 600,000,000 and 900,000,000, due, of course, to the enhancement in working capacity through the use of electric power.

The article discusses the recent history of power supply in the United States, showing the decentralizing influences at work. "Just as the construction of the railway network made possible the typical American civilization of the latter half of the nineteenth century, so the construction of the network of power lines in the United States heralds the typical civilization of the twentieth century. It is indicative of the swift tempo of our day that the spread of the network of power lines is now proceeding at a much more rapid rate than the construction of rail lines in the earlier years of the railway empire building. In the seven years, 1921-1927, inclusive, the sum of $1,091,774,405 was spent for electric transmission lines. The value of all railway operating property in the United States after three-quarters of a century was only $11,244,852,000."

The author proceeds to point out how this widespread distribution of power enables industry to decentralize from the city to outlying districts and he points out the social and economic implications of such a change.

The book asserts that simultaneously with these technical improvements, which have made it possible to decentralize the factory system, there has appeared in the economic life of the great cities a law of diminishing returns.

The increasing difficulties and cost of metropolitan life have reacted upon industry, the book states, so that industrial leaders have been aroused to the advantages of diffusion. Charles Kettering of General Motors Research Corporation, Carl Alsberg, bakery expert; E. J. Kulas, steel manufacturer,

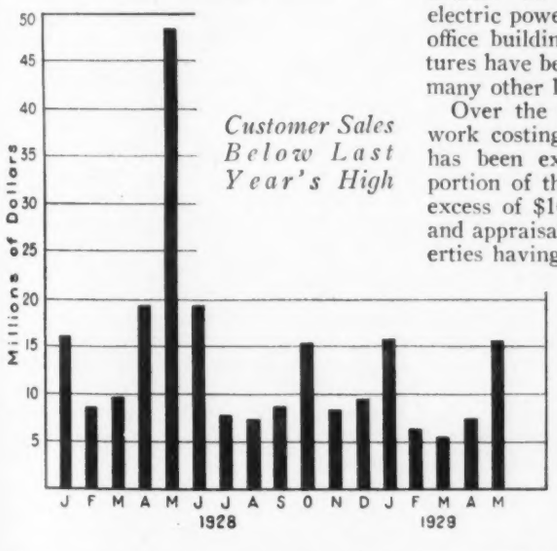
and other key men of American industry, are quoted in the book as advocating decentralization and greater simplicity of industrial plant.

It is declared in the utility company's study that city growth after a certain point of saturation creates more handicaps than facilities for productive industries. Per capita tax rates are shown to increase more rapidly as the cities attain greater size.

In the larger cities labor and electric power are both diverted in increasing measure from productive and socially profitable uses to mere efforts to overcome the handicaps of congestion—such as costly rapid transit, the erection of buildings of great height, and the immense outlays required for the maintenance and operation of such structures. The problem of urban water supply is briefly discussed in the book, with the observation that water resources determine the ultimate limit of city growth. The contention of the book is that the present layout of citizens is not abreast of the achievements of science and engineering.

Larger Customer-Ownership Sales in May

Sales of electric light and power company stock to customers, employees and other local parties in May consisted of 33,800 transactions, involving 342,450 shares, valued at $15,588,000, according to reports received by the ELECTRICAL WORLD. This is a decided increase over



April and several preceding months. The average sale was $460 per transaction. This figure is influenced by the unusually large sale of low-priced stock in relatively small parcels and correspondingly numerous transactions. More than $6,000,000 was reported for shares in $25 group by one company. The remainder was in the $100 class, though varying somewhat from this figure in some cases. In this class, one company reported sales of $3,000,000; one other exceeded $1,000,000 and a third closely approached that amount. Thus these four campaigns account for a large portion of the total sales.

Stone & Webster, Inc., Shows Rapid Growth

STATEMENTS published in connection with the recent listing of Stone & Webster common stock on the New York Stock Exchange call attention to the rapid growth of this organization, which is so closely associated with the utility history of this country. These statements show security holdings of $34,634,299 and investments in constituent companies valued at $7,364,480.

Stone & Webster, Inc., was originally established to serve in a reporting and consulting engineering capacity. Soon design and consulting work was undertaken, and later the firm entered upon the supervision of operating utilities. Power stations have been designed and built with an aggregate of more than 4,000,000 hp. of steam and hydro-electric capacity. This represents approximately 10 per cent of the installed capacity of the central-station industry in this country and serves 20,000,000 people with electric power and light. The undertakings include the construction of such steam-power stations as the Long Beach stations for the Southern California Edison Company, and the Edgar station for the Edison Electric Illuminating Company of Boston, and also the building of such nationally known hydro-electric plants as Big Creek, Keokuk and Conowingo, the largest single hydro-electric power installation in the United States. In addition steam and hydro-electric power stations, industrial plants, office buildings, hotels and other structures have been designed and erected for many other large corporations.

Over the past 25 years construction work costing more than $1,000,000,000 has been executed. The uncompleted portion of the work now on hand is in excess of $100,000,000. Expert reports and appraisals have been made on properties having a total value of more than $6,800,000,000. Approximately 75 per cent of the engineering and construction work done is for clients not connected with the organization and 25 per cent for the companies whose operations are supervised by Stone & Webster, Inc.

In June the company announced the formation of a $100,000,000 corporation, in which the public was offered a 40 per cent participation. This new organization is under the same management, but has an enlarged board of directors and is a Delaware rather than a Massachusetts corporation.

The largest single investment of the company is in the Engineers Public Service Company, $11,096,260 of common stock and $1,380,444 of option warrants. The next largest holding, $7,895,539, is in the common stock of the General Public Service Corporation. Other large holdings are in the Utility Equities Corporation, Railway & Light Securities Company, Tampa Electric Company, Columbus Electric & Power Company and American Commonwealth Power Corporation. Details of the company's securities holdings follow:

Shares	Company	Market or Fair Value June 30
38,133	Am. Commonwealth P....	$1,163,000.00
4,750	Banque Generale Belge....	251,750.00
239	Cape Breton El. Co., Ltd...	12,667.00
14,557	Col. Elec. & Pwr.....	1,715,959.42
6,000	Devonshire Investing.....	321,000.00
11,011	Eastern Utility Asso.....	418,418.00
10,039½	Do.....	140,549.50
180,427	Engineers Pub. Service....	14,096,260.50
39,725	Do.....	1,380,443.75
2,844	Fall River Elec. Light.....	182,964.00
407	Fall River Gas Works.....	20,350.00
10,000	First Nat. Bank of Boston.	1,400,000.00
505	Galveston-Houston Elec...	24,745.00
123,367	Gen Public Service.....	7,895,539.20
259	Haverhill Gas Light.....	15,022.00
1,000	International Power Sec...	.....
4,500	Do.....	100,000.00
2,440	Jackson Hts Gar., Inc.....	.....
434	Do.....	.....
$323,800	Do.....	323,800.00
10,497	Jamaica Pub. Ser. Ltd.....	325,407.00
1,763	Lowell Elec. Light.....	95,202.00
1,000	Manchester (Mass.) Elec..	60,000.00
2,931	Northern Texas Elec.....	35,172.00
26,315	Railway and Lt. Sec.....	2,184,145.00
$3,500	Russian Fin & Const.....	3,500.00
150	Do.....	.....
200	Do.....	.....
18,702	Soc. Idroelettrica Piem....	158,967.00
3,300	Southern Calif. Edison....	220,275.00
25,358	Southern Ice.....	302,296.00
26,511	Tampa Electric.....	2,014,886.16
506	Taunton Gas Light.....	80,960.00
168	Do.....	26,880.00
98,161	Utility Equities.....	2,625,806.75
.....	Miscel. inv. in civic org....	17,830.00
.....	Directors' qualifying shs and odd lots.....	10,503.80
	Market value of securities owned.....	$34,624,299.08

Stone & Webster's investments in constituent companies, carried at cost, follow: 40,000 shares of Stone & Webster & Blodgett capital stock, $4,000,000; 70,000 Stone & Webster Engineering Corporation preferred, $1; 90,000 shares of Stone & Webster Engineering Corporation common, $2,364,479; 10,000 Stone & Webster Realty Corporation common stock, $1,000,000; total, $7,364,480.

New Capital Issues

During the week ended August 8 Electric Investors, Inc., issued 30,000 shares of $6 preferred stock at $98.50 per share and accrued dividends, to yield nearly 6.10 per cent. Proceeds from the sale of this $6 preferred stock will provide funds for the acquisition of additional interests in electric power and light companies.

The North American Water Works & Electric Corporation issued 25,000 shares of A common stock at $23 per share flat. This organization furnishes directly or indirectly through operating subsidiaries electric light and power and water services to more than 170 communities in Maine, Pennsylvania, Ohio, Illinois, West Virginia, Maryland, Kentucky and Arkansas and ice service to 27 communities in Georgia, North Carolina and Kentucky.

The Electric Bond & Share Company issued 100,000 shares of $6 cumulative preferred stock at $105 per share and accrued dividends, to yield over 5.70 per cent.

Current Earnings Reports of Electric Light and Power Companies

	1929	1928	Per Cent Increase	Operating Ratio 1929	Operating Ratio 1928
Associated Gas & Elec. & Subs. (Year ended May 31)					
Gross earnings	$57,140,821	$42,006,909	36.0	54	57
Net earnings	26,013,699	18,167,902	43.0	..	..
Buffalo, Niagara & Eastern Power & Subs. (Six-mos. ended June 30)					
Gross earnings	18,219,959	16,660,558	9.4	40	41
Net earnings	7,336,187	6,858,199	6.9	..	..
Carolina Power & Light (Year ended May 31)					
Gross earnings	9,230,447	8,943,670	3.0	46	53
Net earnings	4,986,906	4,234,251	18.0	..	..
Central Illinois Light (Year ended June 30)					
Gross earnings	4,934,497	4,571,499	8.0	59	60
Net earnings	2,045,289	1,825,388	12.0	..	..
Cities Service (Year ended June 30)					
Gross earnings	38,422,712	33,187,476	15.8	..	..
Net earnings	37,220,093	32,062,371	16.1	..	..
Columbus Elec. & Pwr. & Subs. (Year ended May 31)					
Gross earnings	4,354,438	4,369,759	—0.3	..	..
Net earnings	2,392,462	2,374,693	0.7	..	..
Commonwealth Power (Year ended May 31)					
Gross earnings	61,073,872	55,158,163	10.7	51	53
Net earnings	29,688,049	25,989,124	14.2	..	..
Consumers Power (Year ended May 31)					
Gross earnings	32,151,668	28,094,454	14.4	49	51
Net earnings	16,311,147	13,777,563	18.4	..	..
Eastern Utilities Associates & Subs. (Year ended May 31)					
Gross earnings	8,909,290	8,390,363	6.2	..	..
Net earnings	3,474,835	3,024,260	14.9	..	..
Engineers Pub. Serv. & Subs. (Year ended May 31)					
Gross earnings	40,894,038	30,142,493	35.8	57	60
Net earnings	17,125,611	11,859,333	45.0	..	..
Federal Light & Traction & Subs. (Year ended June 30)					
Gross earnings	8,267,641	7,415,269	11.5	59	61
Net earnings	3,389,437	2,874,169	17.3	..	..
Galveston-Houston Electric & Subs. (Year ended May 31)					
Gross earnings	5,262,637	5,190,466	1.4	..	..
Net earnings	1,719,689	1,679,457	2.4	..	..
Nebraska Power (Year ended May 31)					
Gross earnings	$5,579,767	$5,047,479	11.0	51	53
Net earnings	2,722,798	2,393,233	14.0	..	..
Nevada-California Electric & Subs. (Year ended June 30)					
Gross earnings	5,469,394	5,373,439	1.8	46	43
Net earnings	2,958,402	3,047,936	—2.9	..	..
North American & Subs (Year ended June 30)					
Gross earnings	142,545,550	128,136,507	11.2	52	52
Net earnings	68,384,529	60,820,206	12.4	..	..
Kansas City Power & Light (Year ended June 30)					
Gross earnings	14,225,936	13,322,998	6.8	51	51
Net earnings	6,953,751	6,502,003	6.9	..	..
Penn-Ohio Edison—Northern Ohio Power (Year ended May 31)					
Gross earnings	28,589,019	26,695,584	7.1	60	62
Net earnings	11,517,115	10,020,747	14.9	..	..
Portland Electric Power (Year ended May 31)					
Gross earnings	12,630,865	12,292,991	2.7	59	59
Net earnings	5,143,059	5,018,722	2.5	..	..
Puget Sound Power & Light & Subs. (Year ended May 31)					
Gross earnings	15,618,159	14,931,451	4.6	..	..
Net earnings	6,478,613	6,549,882	—1.1	..	..
Southern California Edison (Year ended June 30)					
Gross earnings	37,310,785	32,629,041	14.0	35	33
Net earnings	24,346,175	21,970,134	11.0	..	..
Tennessee Electric Power (Year ended June 30)					
Gross earnings	13,929,809	12,907,557	7.9	50	54
Net earnings	6,832,491	5,960,417	14.6	..	..
Texas Power & Light (Year ended May 31)					
Gross earnings	9,592,190	9,488,277	1.0	50	55
Net earnings	4,772,312	4,216,501	13.0	..	..
Utah Power & Light (Year ended May 31)					
Gross earnings	11,347,902	10,724,553	6.0	49	49
Net earnings	5,814,001	5,465,274	6.0	..	..
Virginia Electric & Power & Subs. (Year ended May 31)					
Gross earnings	16,636,010	15,748,126	5.7	..	..
Net earnings	7,358,664	6,522,986	12.8	..	..

Central Stations in Canada Report Increase in Output

A 13.6 per cent increase in the output of central electric stations in Canada is recorded for the month of May, as compared with similar figures for a year ago. Every one of the economic areas of the country contributed to this increase. Exports of power were considerably lower during the month, which indicates that domestic consumption has increased very materially. The monthly output was 1,456,000,000 kw.-hr. There was a slight falling off in the amount of water power generated by fuel as compared with the month of April, but the May, 1929, figure is approximately 50 per cent higher than that for May, 1928. The greatest increase comes from the province of Quebec, where power output jumped nearly 110,000 kw.-hr. within a year. The largest percentage increase came from the Maritime provinces, which showed nearly a 40 per cent increase above the 1928 output. The average daily output of the stations in May, 1929, was 46,986 kw.-hr., as compared with 46,970 for the month of April and 41,317 for May, 1928.

TORONTO COMMISSION REPORTS SUCCESSFUL YEAR.—A steady increase in all branches of the Toronto Hydro-Electric Power Commission is shown in a recent statement. An increase of 2,379 in the number of consumers over the past year is reported and the total number is listed as being 170,748. The horsepower load now stands at 842,292, an increase of 42,168 over last year. Kilowatt-hours sold to June 30, this year, amount to 390,282,278, an increase of 52,848,044 over last year. Total revenue up to the end of June this year was $6,118,368, an increase of $580,836. The assets of the commission now stand at $43,582,837.

Light and Power Plants in Peru

Special circular No. 557 of the Electrical Equipment Division of the Bureau of Foreign and Domestic Commerce lists 63 cities and towns in Peru having service from central light and power plants. It gives for each town the name of the company serving it, the capacity of the plant in kilowatts and horsepower, the type (a.c. or d.c.), voltage, frequency and number of phases in the secondary distribution and the classification of the plants with reference to source of energy: Hydro, oil, gas, or steam. The two largest plants are in Lima and in Oroya, 20,800 and 11,250 kw., respectively. Most of the others are very small; 36 are of less than 100 kw. each.

CONNECTICUT ELECTRIC SERVICE INCREASES STOCK.—Directors of the Connecticut Electric Service Company, Hartford, Conn., on July 25 voted a 20 per cent increase in common stock of no-par value. The new issue will be offered to stockholders of record August 20 at $75. The holders of the convertible preferred stock are given the opportunity to change to common stock. Common-stock holders will be given the rights to subscribe for the new issue at the ratio of one new share for each five held. Right to subscribe expires September 17. The issue will finance the calling of the preferred stock of the principal subsidiary, the Connecticut Light & Power Company, which voted to call its 8 and 7 per cent preferred stocks, amounting to $8,500,000, and will be used also to acquire the Winsted Gas Company.

THE STATE LINE GENERATING COMPANY, an Insull company, has received from the Indiana Public Service Commission authority to borrow money for construction as needed from four operating utilities. Amounts up to $5,000,000 may be borrowed on the basis of stock ownership from the Interstate Public Service Company, the Northern Indiana Public Service Company, the Commonwealth Edison Company and the Public Service Company of Northern Illinois.

Business News and Market Conditions

Copper and Lead Are in Excellent Demand

A brisk demand for both copper and lead was the feature of the non-ferrous metal markets in the week ended Wednesday. Zinc, tin and silver were all quiet and no price changes of importance were registered for any of the metals. London quotations, also, are about the same as a week ago, with a slight advance in standard copper and in lead and a slight decline in tin. Buying of metals promises to continue moderately active in the weeks to come, with the demand largely for early shipment. Those who predicted a recession in industrial activity this fall seem now inclined to temper their opinion, and the action of the stock market would indicate that no such recession is expected by the public.

NEW YORK METAL MARKET PRICES

	July 31, 1929 Cents per Pound	Aug. 7, 1929 Cents per Pound
Copper, electrolytic	18	18
Lead, Am. S. & R. price	6.75	6.75
Antimony	8.625	8.75
Nickel, ingot	35	35
Zinc, spot	7.15	7.15
Tin, Straits	47.25	47
Aluminum, 99 per cent.	24.30	24.30

Base copper wire price Aug. 7, 1929, 18¼ cents.

Equipment Exports Up 34.3 per Cent

Exports of electrical products for the first five months of the year totaled $59,102,606, against $44,012,011 for the corresponding period of 1928. May's total showed an increase of 13.2 per cent over May, 1928.

Outside of Canada, the largest buyer of these exports, the leading buyers were Argentina, Australia and Mexico.

Substantial increases were registered in the case of radio apparatus, motors and parts, rectifiers, steam turbo-generator sets, etc.

Electrical Exports for May, 1928 and 1929

(Issued by Bureau of Foreign and Domestic Commerce)

Article	May 1928	May 1929
Generators:		
Direct current—		
Under 500 kw.	$110,412	$88,655
500 kw. and over	81,578	15,860
Alternating current—		
Under 2,000 kva.	15,354	21,116
2,000 kva. and over	96,601	.....
Steam turbine generator sets	73,558	108,551
Accessories and parts for generators	106,932	67,185
Self-contained lighting outfits	103,082	106,748
Batteries:		
Flashlight batteries	224,397	249,131
Other dry and wet cell primary batteries	250,130	.....
Radio B and C batteries (dry)	.....	95,401
Other, not elsewhere specified	.....	143,177
Storage batteries	236,515	283,336
Transforming or converting apparatus:		
Power transformers, 500 kva and over	91,976	87,958
Distribution transformers, less than 500 kva	63,795	91,140
Instrument transformers	19,123	14,612
Other transformers, n.e.s.	82,193	90,340
Complete battery chargers under 15 amps.	23,848	20,114
Rectifiers, double current and motor generators, dynamotors, synchronous, and other converters	97,159	143,704
Transmission and distribution apparatus:		
Switchboard panels, except telephone	102,493	58,131
Switches and circuit breakers over 10 amps.	162,633	136,074
Fuses and fuse blocks	37,162	42,765
Watt-hour and other measuring meters	70,158	98,312
Recording, indicating, etc. apparatus—		
Electrical indicating instruments	34,440	41,205
Electrical recording instruments	21,987	17,474
Other electrical testing apparatus	53,701	76,287
Lightning arresters, choke coils, reactors and other protective devices	82,806	66,078
Motors, starters and controllers:		
Motors, ¼ hp. and under	$188,555	$209,140
Motors, over ¼ and under 1 hp.	71,302	66,453
Stationary motors—		
1 to 200 hp.	219,725	237,259
Over 200 hp.	18,340	26,694
Railway motors	136,334	2,596
Electric locomotives—		
Railway	287,920	.....
Mining and industrial	80,283	13,341
Station and warehouse electric motor trucks	27,803	6,542
Starting and controlling equipment—		
For industrial motors	111,621	162,812
For electric railway and vehicle motors	41,528	53,595
Portable electric tools	102,867	.....
Portable electric tools, except automotive	.....	116,721
Automotive electric machine tools	.....	4,478
Accessories and parts for motors	203,899	265,351
Electric appliances:		
Electric fans	76,342	99,859
Electric lamps—		
Metal filament	97,259	104,392
Other electric lamps	34,335	34,937
Flashlights	247,074	222,903
Searchlights and projectors	35,248	40,065
Motor-driven household devices—		
Electric household washing machines	191,166	197,711
Electric vacuum cleaners	220,624	112,650
Other motor-driven devices, except tools	106,157	107,811
Electric flatirons	26,498	33,972
Domestic heating and cooking devices—		
Electric cooking ranges	19,226	14,391
Other domestic heating and cooking devices	75,490	70,804
Industrial electric furnaces and ovens	30,614	29,203
Therapeutic apparatus, X-ray machines, galvanic and faradic batteries, etc	120,685	140,866
Signal and communication devices:		
Radio apparatus	$633,586	$1,266,356
Telegraph and telephone apparatus	403,347	716,402
Railway signals, switches, and attachments	55,028	140,463
Bells, buzzers, annunciators and alarms	28,751	27,362
Other electric apparatus:		
Spark plugs	68,860	163,544
Other starting, lighting, and ignition equipment	119,221	113,062
Insulating material	120,314	78,422
Metal conduit, outlet and switch boxes	157,426	102,861
Sockets, receptacles, and lighting switches	176,846	195,049
Electric interior lighting fixtures	158,345	217,971
Electric street lighting fixtures	44,290	48,536
Other wiring supplies and line material	78,868	110,566
Other electrical apparatus, not elsewhere specified	832,588	903,008
Rubber and friction tape	50,359	35,472
Globes and shades for lighting fixtures	49,540	69,616
Electrical glassware except for lighting	21,605	36,127
Electrical porcelain:		
For less than 6,600 volts	85,336	54,622
For 6,600 volts and over	54,418	65,666
Carbons, carbon brushes and electrodes:		
Electrodes for electric furnaces	192,894	237,306
Other carbon products	75,757	71,080
Insulated wire and cable, iron or steel	25,496	39,901
Copper, bare wire	203,712	393,095
Copper, insulated wire and cable	426,190	468,618
Refrigeration sets up to 1 ton capacity	781,838	.....
Refrigeration sets up to ¼ ton capacity	.....	1,017,674
Refrigeration sets over ¼ to 1 ton capacity	.....	48,237
Totals	$9,857,543	$11,158,916
Five months ended May 31	$44,012,011	$59,102,606

DESTINATION OF ELECTRICAL EXPORTS

Country of Destination	May, 1929 Value
EUROPE:	$1,981,586
Belgium	110,611
France	207,585
Germany	229,146
Italy	225,223
Netherlands	103,615
Spain	251,223
Sweden	60,748
United Kingdom	568,947
Other countries	224,488
WESTERN HEMISPHERE:	$6,565,286
Canada	3,449,509
Mexico	600,753
Cuba	359,748
Argentina	765,697
Brazil	448,120
Chile	221,344
Colombia	192,072
Peru	56,405
Venezuela	87,677
Other countries	383,961
ASIA, AFRICA AND OCEANIA:	$2,612,044
British India	85,615
China	436,816
Japan	457,008
Philippine Islands	158,819
Australia	698,359
New Zealand	250,815
Union of South Africa	151,494
Other countries	373,118

Market Conditions

MIDSUMMER RECESSION in equipment buying evident in most sections—a few notable exceptions. Aircraft and automobile industries buying motors and allied apparatus, especially in Eastern district.

——NEGOTIATIONS LAGGING AND ACTUAL SALES BELOW NORMAL in New England. Airfield floodlighting provides some interesting business.

——EQUIPMENT BUYING ON CONSERVATIVE BASIS in Middle West, but day-to-day orders about normal.

——POLES AND CABLE STILL LEAD Pacific Coast business, but some substantial plant construction reported.

MIDDLE WEST

A SLIGHT acceleration of general business was noticeable this week in the Middle West section. The major activities continue in a favorable position, while industrial activity is still somewhat spotty. The various utility companies are continuing their expansion programs with a considerable amount of construction work going on. A conservative policy with regard to future commitments is being adhered to.

Some of the interesting orders placed this week include 5,000 ft. of single-conductor, 2,000,000-circ.mil paper and lead covered 500-volt cable, 30,000 ft. of three-conductor, 375,000-circ.mil paper and lead covered 5-kv. sector cable, 10,000 ft. of four conductor, 375,000-circ.mil paper and lead covered 5-kv. sector cable, 40,000 ft. of three-conductor, 500,000-circ.mil paper and lead covered 13-kv. sector cable, several construction orders aggregating $100,000 and "Mazda" lamps valued at $150,000. There has been an excellent demand for motors, starting apparatus, fans and electric refrigerators. Prices remain generally firm. Construction projects are as follows:

The Snap-On Wrench Company, Milwaukee, Wis., plans plant to cost $140,000. The Wisconsin Box Company, Wausau, Wis., will build an addition to wooden box factory, to cost $100,000. The Neshonac Light & Power Company, West Salem, Wis., has approved plans for power plant, reported to cost close to $75,000. The Clarke Transmission Company, Berrien Springs, Mich., plans addition to automotive equipment plant to cost $100,000. The Medusa Portland Cement Company, Cleveland, Ohio, plans cement mill at Charlevoix, Mich., to cost $2,000,000. The Ford Motor Company, Detroit, Mich., has approved plans for an addition to aircraft plant at Dearborn, to cost more than $150,000. The Packard Motor Car Company, Detroit, Mich., is completing plans for multi-story addition, reported to cost $250,000. The Standard Tube & Manufacturing Company, Detroit, Mich., contemplates plant at Ferndale, reported to cost more than $100,000. The Chevrolet Motor Company, Flint, Mich., has filed plans for metal stamping plant to cost $400,000. The New Orleans Fruit Company, Flint, Mich., will build cold storage and distributing plant to cost more than $50,000. The Michigan Steel Tube Products Company, Hamtramck, Mich., will make extensions and improvements to cost $350,000. The Lake Orion Airport, Inc., Lake Orion, Mich., plans floodlighting system and beacon lamps at proposed airport.

ST. LOUIS DISTRICT

BUSINESS in the St. Louis district has held up to the level previously reported. July sales were above normal and the first week in August has maintained the steady volume of the previous two months. Line supplies continue to lead and radio sales are improving.

One of the manufacturing chemical companies contracted for a 3,000-kw. turbo-generator unit of the extraction type to cost $55,000. A power company bought two truck type switchboard panels for $5,000 and one of the railway companies three 200-kva., 25-cycle transformers costing $6,000. Construction projects are as follows:

Joplin, Mo., has approved plans for ornamental lighting system on Joplin Street and other thoroughfares. The Con-Ferro Paint & Varnish Company, St. Louis, Mo., has filed plans for an addition to cost $100,000. Lees Summit, Mo., plans municipal electric light and power plant to cost $100,000. Fairview, Okla., plans extensions and improvements in lighting system to cost $25,000. The Farmers' Gin Company, Sayre, Okla., plans group of three cotton oil mills to cost $100,000. Seminole, Okla., plans floodlighting system and beacon lamps at proposed municipal airport, entire project to cost about $40,000. Conway, Ark., contemplates a municipal ice-manufacturing plant to cost $35,000. The Southwestern Gas & Electric Company, Shreveport, La., will make extensions and improvements in light and power system at Harrison, Ark., to cost $60,000. Little Rock, Ark., plans floodlighting system and beacon lamps at proposed municipal airport, entire project to cost $200,000. The Arkansas Power & Light Company, Pine Bluff, plans transmission line from McGehee to Halley, Ark., reported to cost $40,000. Denton, Tex., plans ornamental lighting system. The Central Power & Light Company, San Antonio, Tex., plans ice-manufacturing plant at Mercedes, Tex., to cost close to $200,000; and a similar plant at Elsa, Tex., to cost about $85,000. The Texas Milk Products Company, Mount Pleasant, Tex., plans powdered milk plant to cost about $175,000. The Texas-Louisiana Power Company, Fort Worth, Tex., has approved plans for steam-operated electric power plant at Perryton, Tex., to cost about $70,000. The Gulf States Utilities Company, Beaumont, Tex., contemplates extensions and improvements in power plant, and additions in transmission lines, reported to cost more than $100,000; a power substation will be built at Port Arthur, Tex., to cost $175,000. The Austin Brokerage Company, Springfield, Mo., plans food canning plant at Raymondville, Tex., to cost about $70,000. The Texas Electric Service Company, Fort Worth, plans substation at Sweetwater, Tex., reported to cost close to $90,000.

NEW ENGLAND

HEAVY industrial equipment sales have fallen off in this district and manufacturers report little activity among central stations. Negotiations are lagging. A few central-station additions requiring additional equipment are expected to be considered in the early fall. Small motor sales are quiet.

During the past week orders for single motors showed a total above that for the corresponding week last year. Small switches and control equipment orders are steady and replacement orders are reported in fair strength. General scheduled material sales are slack as compared with the previous week.

Some of the electrical specialties, on the other hand, are attracting interest. Development of airports in the New England territory recently has reflected a demand for floodlighting, poles, cable, and control equipment. Orders were placed for a western Massachusetts field and for the Boston Airport and a number of new projects are under consideration. Sales of structural welding equipment are reported progressing. They include an order for an arc welder for a steel fabricating company. In Connecticut, one city will expend about $10,000 for street lighting. Another will install a number of 1,000-watt lamps. Extensions to a number of Massachusetts city services are announced.

New construction materials are moving and a fair trend is noted in supplies for mercantile and warehouse buildings. One manufacturer records sales during the past week of wire, wiring devices and hardware totaling over $5,000. Merchandising is steady and shows gains over last year for the corresponding week.

The Strathmore Paper Company, Mittineague, Mass., plans hydro-electric power plant at West Springfield, Mass., reported to cost close to $100,000. The United Illuminating Company, New Haven, Conn., has approved plans for addition to steam-operated electric generating station at Bridgeport, to cost more than $1,000,000. The Nash Engineering Company, Norwalk, Conn., will build addition to air compressor manufacturing plant to cost about $45,000.

Eastern District

August has opened up with unmistakable signs of summer recession in the Eastern district. Sales are growing more scattered, both in central station and industrial account, and inquiries are correspondingly lighter. There is a fair turnover, however, for this season of the year and business in general is at a higher level than at this time twelve months ago. Industrial demand is rather varied, with motors, controls and auxiliary equipment taking the lead.

A manufacturer of electric household appliances in Connecticut has purchased a quantity of motors from a New York maker, to cost $28,000. A railroad in Philadelphia has contracted for electrical power equipment for a warehouse unit to an amount of $35,000. Several iron and steel mills in the western Pennsylvania and eastern Ohio districts are said to be entering the market for heavy industrial motors and accessory apparatus for expansion programs now in progress. The aircraft industry has developed as a prominent buyer of electrical equipment in connection with plant construction and operations; a manufacturer of cable reports a sale of 300,000 ft. of material to a company in that line in New Jersey, while another producer of airplane motors has given an order for 22,000 ft. of cable for a plant unit in Connecticut. Automobile account continues as another bright spot in the industrial field and several important orders are now pending for motors and allied apparatus from interests in the Detroit district.

Central-station commitments are reduced. A power company in Georgia has placed an order with a New York manufacturer for a 2,000-kw. turbo-generator unit for early delivery. A metropolitan central station has contracted for a quantity of wire and cable to cost $125,000. Transformer sales, while indicating slight decline, bid fair for early resumption, based on incoming inquiries both for indoor and outdoor substation apparatus. Transmission line equipment is in fair call, with advance fall business showing up strong. Construction projects are as follows:

The Delaware, Lackawanna & Western Railroad Company, New York, will receive bids until August 16, for mercury-arc rectifiers, transformers, circuit breakers, etc., and for six current-limiting reactors, for an electrification program on suburban lines in New Jersey. The Curtiss Airports Corporation, New York, plans an airport with motor shops and other field units at Valley Stream, L. I., to cost $500,000. The Prest-O-Lite Company, New York, plans a plant at Tampa, Fla., to cost $100,000. The Chance Vought Aircraft Corporation, Long Island City, N. Y., plans an aircraft manufacturing plant at Hartford, Conn., to cost $1,000,000. The Eastman Kodak Company, Rochester, N. Y., plans an expansion and improvement program for increased capacity to cost $10,000,000. The Signal Supply Officer, United States Signal Corps, Brooklyn, N. Y., will receive bids until August 20, for switchboard relays, resistance wire, 110,000 ft. radio frequency cable wire, and for 100 variable condensers (Circulars 6, 8, and 9). The Knickerbocker Ice Company, New York, plans an ice manufacturing plant reported to cost $100,000. The Consolidated Aircraft Corporation, Buffalo, N. Y., plans a plant at Fort Erie, Ont., to cost more than $150,000. The American Solvents & Chemical Corporation, New York, plans a plant expansion and improvement program to cost more than $2,500,000. The Westinghouse Electric & Manufacturing Company, East Pittsburgh, Pa., plans an equipment storage and service plant at Newark, N. J., to cost more than $400,000. The Ford Motor Company, Detroit, Mich., has taken title to property at Edgewater, N. J., and plans a branch assembling plant to cost more than $3,000,000. The North Jersey District Water Supply Commission, Newark, N. J., will receive bids until August 20, for two motor-generator exciter sets, transformers, switchgear, etc., for the Wanaque Dam waterworks. The Public Service Electric & Gas Company, Newark, will proceed with a power substation at Plainfield, N. J., reported to cost $85,000; also, for a similar substation at Paterson, N. J., to cost $115,000. The Rockland Electric Company, Closter, N. J., plans a transmission line from Allendale to Norwood, about 15 miles, to cost about $90,000. The Reading Company, Philadelphia, Pa., will build an electric car repair shop to cost $150,000.

Southeast

General business conditions continue fair in the Southeast as a whole. The prevailing optimism in Georgia, Alabama and Tennessee was reflected last week by several large appliance orders coming in to the Atlanta branches of the appliance manufacturers.

One of the Atlanta banks announced an addition to its present building to cost approximately $2,000,000. This project, along with numerous smaller jobs, continues to keep building activity in Atlanta well above the normal figure and results in a supply business for the local jobbers well above that usually experienced at this season of the year. Announcement of the sale of electrical equipment totaling $260,000 to the Gulf State Steel Company at Alabama City and low-tension switching equipment to the Atkinson steam plant in Atlanta totaling approximately $90,000 were the principal items reported by manufacturers during the week. In addition, utility companies bought approximately 220,000 lb. of wire, transformers worth $28,000 and storage batteries valued at $4,000. Electric range sales in the compaigns in progress in Georgia required the delivery of three additional carloads of ranges above what had been stocked for these campaigns.

The Chesapeake & Ohio Railway Company, Richmond, Va., has approved plans for extensions and improvements in engine house and repair shops at Hinton, W. Va., reported to cost $250,000. The Durham Public Service Company, Durham, N. C., will install ornamental lighting system on Parrish Street. The Southern Public Utilities Company, Charlotte, N. C., plans extensions and improvements in transmission lines at Ellenboro, N. C., and vicinity. The Carolina Power & Light Company, Raleigh, N. C., plans construction of transmission line in vicitnity of Columbia, S. C., reported to cost more than $75,000. The United States Engineer Office, Vicksburg, Miss., will receive bids until August 15, for one 10 kw. generator unit (Circular 21). The Montevallo Cotton Mills, Montevallo, Ala., has plans for mill unit to cost $100,000. The Champion Paper Company, Canton, N. C., contemplates pulp and paper mill near Tuscaloosa, Ala., to cost more than $2,000,000. The B. F. Goodrich Company, Akron, Ohio, plans early construction of rubber mill for tire and tube production at Atlanta, Ga., to cost $1,250,000.

Pacific Coast

With the total volume of business approximating normal, on the Pacific Coast, poles and cable continue to lead the commodities in demand by power companies. Substantial construction projects are in prospect. Demand for central-station equipment for current needs is probably in excess of that in evidence a year ago.

Pole business includes carloads of sizes 35 and 40 ft. for Tracy, St. Helena, Ramona and Petaluma, three carloads of 60 ft. for Fresno and a $15,000 proposal for a year's supply. Wire orders are especially numerous, covering such items as $11,000 worth of No. 3/0 weatherproof, $30,000 worth of bare copper, $6,000 worth of 15,000-volt, No. 2 stranded rubber-covered and $7,000 worth of triplex 15,000-volt paper and lead cable. Honolulu is in the market for $9,000 worth of steel taped rubber and leaded 5,000-volt sector cable and $5,000 worth of submarine cable. The city of Los Angeles budget for 1929-30 covers $1,500,000 worth of public buildings, including a 200-bed hospital wing and X-ray installation, and a 300-kw. motor-generator set.

Another big prospect is the proposed $2,600,000 steam plant for Phoenix, Ariz. The Modesto irrigation district, on the other hand, has substituted for its proposed Diesel plant a contract with the San Joaquin Light & Power Corporation.

The movement of heavy apparatus has been light in the northern sections, featured by the sale of a motor-generator set and one 150-hp. motor costing $10,000 to the Washington Veneer Company at Olympia, Wash., and similar equipment to the Wheeler-Osgood mill in Tacoma by the General Electric Company. Sale of about $1,500 worth of central-station equipment, including disconnecting switches, to a local central station is reported. Bids were opened for about $200,000 worth of elevators, motors and control apparatus for a $2,300,000 addition to the county-city building in Seattle. Bids for in excess of $33,000 worth of electrical equipment, motors, etc., are being considered for West Spokane Street bridge. Plans for development of a $12,000,000 initial unit of the $20,000,000 hydro-electric project at Rock Island, on the Columbia River, by the Puget Sound Power & Light Company awaits the granting of a federal license.

The Southern California Edison Company, Los Angeles, Calif., will build a power substation at Laguna Beach to cost

$60,000. Los Angeles, Calif., will receive bids until Aug. 23, for high voltage transformers. The Pacific Electric Railway Company, Los Angeles, Calif., plans power substation at Los Nietos, reported to cost $50,000. Sacramento, Calif., plans installation of floodlighting system and beacon lamps at proposed municipal airport, entire project to cost $700,000. San Francisco, Calif., plans hydro-electric generating plant in connection with Hetch Hetchy water project, to cost $1,000,000. The Pacific Gas & Electric Company, San Francisco, Calif., plans equipment storage and distributing plant at San Mateo, to cost $50,000. Santa Maria, Santa Ana, Los Angeles, Richmond and San Leandro, Calif., plan ornamental lighting systems. The Mountain States Power Company, Takoma, Wash., plans addition to power plant at Marshfield, Ore., to cost close to $1,000,000, with transmission line extensions. Seattle, Wash., has authorized immediate call for bids for equipment for extensions in municipal hydro-electric project at Diablo, estimated to cost $1,000,000. The Pacific Coast Coal Company, New Castle, Wash., plans rebuilding of coal mining plant recently destroyed by fire with loss reported at $100,000. The Sheep Creek Hydro-electric Company, Spokane, Wash., plans hydro-electric plant on Sheep Creek, tributary of the Columbia River, near Northport, Wash., reported to cost $300,000, with transmission lines. The Tumwater Paper Mills Company, Tumwater, Wash., will carry out an expansion and improvement program to cost $300,000. Yakima, Wash., plans ornamental lighting system. Caldwell, Idaho, plans ornamental lighting system to cost $35,000. Las Vegas, Nev., has authorized call for bids for ornamental lighting system.

Activities of the Trade

General Electric Company Pays Bonus

The General Electric Company on August 6 paid $1,825,832 in supplementary compensation to its factory and office employees who have been in the service of the company for five years or longer. This is the largest bonus ever paid by the company and represents 5 per cent of the earnings of employees for the six months ended June 30. Approximately one-third of the total, or $584,342, was paid to employees at the Schenectady works.

During the past 5½ years the company has paid a total of $15,757,722 in supplementary compensation to its employees under this bonus plan.

THE NATIONAL CARBON COMPANY, INC., 30 East 42d Street, New York City, has appointed Delbert E. Replogle as sales engineer in its product development division with headquarters at New York City. Mr. Replogle comes from the Raytheon Manufacturing Company, Cambridge, Mass., the control of production and sales of whose products has recently been acquired by the National Carbon Company.

THE LEEDS & NORTHRUP COMPANY, 4901 Stenton Avenue, Philadelphia, manufacturer of electrical measuring instruments, etc., announces the appointment of R. L. Sittinger as exclusive sales representative for the L&N metered combustion control apparatus in Maine, New Hampshire, Vermont, Massachusetts, eastern Connecticut and the state of Rhode Island.

SERVEL, INC., New York City, reports for six months ended June 30, 1929, profits of $705,482 after depreciation and interest, but before deducting federal taxes, comparing with $162,744 in first half of 1928. Colonel Frank E. Smith, president, stated that with approximately the same operating expenses in the first half of 1929 as the first six months of 1928, Servel increased its billings 70 per cent. Orders on both electric and gas refrigerators and Hercules products have continued good for the month of July, according to Colonel Smith, and prospects for the third quarter operations are excellent.

Fairbanks, Morse & Company Issues Statement

Gross income of Fairbanks, Morse & Company for the six months ended June 30 totaled $5,060,305. Total orders received from customers for the half year amounted to $18,004,026, against $16,979,597 for the first half of 1928. Actual shipments to customers, however, for the half year amounted to $14,899,927, as against $15,141,879 for the corresponding period last year. The total of unfilled orders on the company's books at June 30 was almost double the amount shown at the beginning of the year. A statement of the income account follows:

	Six Months Ended June 30, 1929
Gross income	$5,060,305.65
Less selling and administration expense	3,075,287.30
	$1,985,018.35
DEDUCT:	
Depreciation of buildings and equipment	$439,255.01
Contributions to pension fund	78,960.77
	$518,215.78
Balance of income	$1,466,802.57
Less debenture interest	192,000.00
Net income	$1,274,802.57
Less reserve for federal taxes	152,976.31
	$1,121,826.26
DIVIDENDS PAID:	
7 per cent preferred stock	$243,911.50
Common stock	553,306.50
	$797,218.00

International General Electric Establishes Closer German Ties

CLOSE co-operation in the world markets as well as a more intimate corporate relationship seem assured from the recent rapprochement between the International General Electric Company and the Allgemeine Elektrizitäts-Gesellschaft, or the German General Electric Company. The American company has acquired 16 per cent of the common stock of the German company and it is understood that five Americans will be appointed to the German company's board at a meeting to be held shortly.

According to unconfirmed reports, this new acquisition of the German company's stock, for which it is understood around $15,000,000 is being paid, will bring the American interest up to 25 per cent or thereabouts. This involves a recapitalization of the German company, including the retirement of its preferred stock. It is stated that a special meeting of Allgemeine stockholders has been called for Aug. 27 to authorize an increase in capital from 186,250,000 to 210,000,000 marks. The 150,000,000 marks common shares will be increased to 210,000,000 marks and the 36,250,000 marks preferred stocks will be retired. Of the additional common shares, 30,000,000 marks will be sold to International General Electric at 210 marks a share, 18,000,000 shares will be issued in exchange for preferred shares and 12,000,000 marks will be held in the treasury for future disposal at the discretion of the directors.

While the International General Electric Company has large interests in leading French and British electrical manufacturing concerns, present negotiations mark the first alliance of great importance with the German electrical industry. Co-operation, of course, will reach to the foreign markets of the two countries, and, according to cables, will involve exchanges of services and patterns.

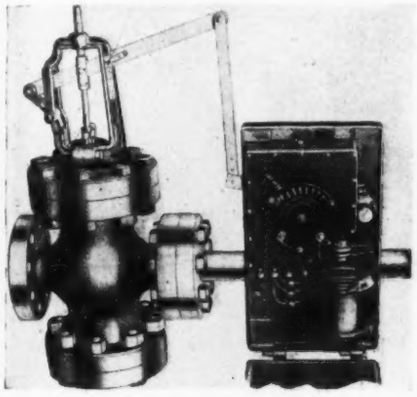
THE WESTINGHOUSE ELECTRIC & MANUFACTURING COMPANY has received an order from the Long Island Railroad Company for multiple-unit control equipment for 40 motor cars. This railroad already operates more than 700 multiple-unit cars equipped with Westinghouse electrical apparatus. The company also has received an order for the electrical equipment for the Bachman pumping station of the city of Dallas, Tex., including eight synchronous motors with exciting and control equipment.

THE EDISON ELECTRIC APPLIANCE COMPANY, INC., 5600 West Taylor Street, Chicago, has recently placed on the market its "Hotpoint" electric cooker jug and its portable electric dinette range.

New Equipment Available

Automatic Flow Control Valve

A valve designed to control automatically the feeding of hot oil to a petroleum-cracking still and built to operate at 1,300 lb. pressure at 600 deg. F temperature is announced by the Brown Instrument Company, Philadelphia. This valve in the still feeder line is controlled by the setting of a Brown automatic control flow recorder located



on the instrument panel of the control house, which may be any distance from the still.

This installation is typical of many applications to the control of steam, water, process liquors, gases, etc. Accurate measurement of the flow at high temperatures and high pressures is an important part of the general problem of high pressures now commanding much attention in the field of steam plant design and in other applications. The automatic control of flow at these high pressures and temperatures, extremely desirable in many applications, adds further application to the manufacturers of flow metering equipment destined to cope with high pressure conditions.

Rectifier Assemblies for Special Purposes

Type B-12 S-5 rectifier assemblies for special purposes, including time clock systems, program ringing, signal systems and recording systems, is announced by the B-L Electric Manufacturing Company, St. Louis.

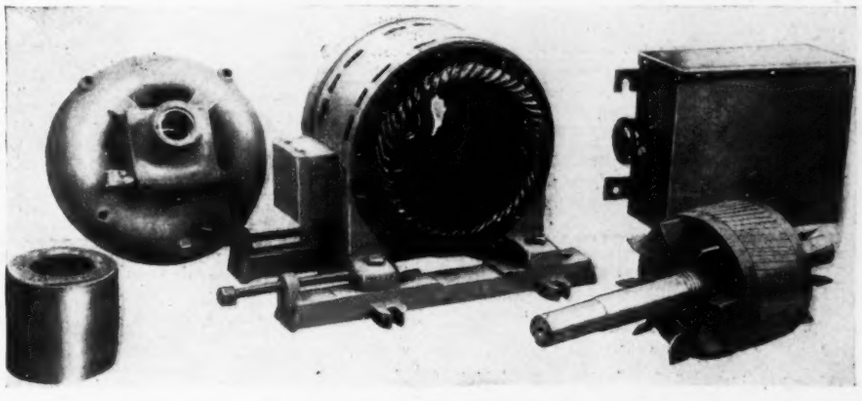
The type B-12 S-5 assembly is completely housed in a steel cabinet with a steel door and special conduit openings to comply with the Underwriters' regulations. The rectifiers are assembled complete with special transformers, terminals, fuse block, etc., completely wired for connection to the a.c. supply line and the d.c. output circuit. The output circuit of each rectifier is brought to properly identified terminals so that if desired special d.c. circuits may be connected to them in the same manner that taps may be taken off from a storage battery. This gives great flexibility to the output connections, according to the manufacturer. A filter may be incorporated in one or more circuits so that intercommunicating telephones can be used from the same rectified current source.

It is claimed by the manufacturer that with this assembly a dependable source of power is provided without the constant maintenance required by a set of storage batteries and charger. It is claimed also that long life with only small replacement cost is insured by the fact that the rectifier units used are sturdy and long-lived and the intermittent nature of the load only tends to increase the period of usefulness of these elements.

"Red Band" Brushless Single-Phase Motor

Simplicity of design is one of the outstanding features of the new "Red Band" brushless single-phase motor recently announced by the Howell Electric Motors Company, Howell, Mich. It is stated by the manufacturer that there is a striking similarity to the ordinary polyphase motor.

The only auxiliary equipment used in the operation of the single-phase motor is the starting unit, which contains starting condensers and a simple, automatic contactor which disconnects the condensers from the circuit as the motor comes up to full speed. Because of this feature the new motor has no brushes, commutators, internal switching devices or wire wound rotor. Because it has no sliding contacts it will not spark, nor



will it interfere with radio reception. It has power factors and efficiencies equal to polyphase models of corresponding ratings and its pull-out and starting torques also compare favorably, it is said. The motor can be reversed at full speed without injury, making it a practical motor for the single-phase operation of machine tools, elevators, hoists and automatic doors and windows, as well as for application for a general purpose motor, according to the manufacturer.

Portable Instruments

Meters operating on the D'Arsonval principle and designed for general testing purposes where medium-sized lightweight instruments may be advantageously used are now available in portable style, as announced by the Westinghouse Electric & Manufacturing Company. Each meter is inclosed in a molded micarta case which provides ample protection against shocks, acids, moisture or other deleterious agents. Each meter occupies a separate compartment in its leather-carrying case.

Street Lighting Cut-out

A new absolute cut-out for series street lighting introduced by the General Electric Company as form S-1 is so constructed that the contacts are self-aligning. When the plug is inserted contact is made before the main circuit is opened, thus preventing arcing. The current-carrying capacity is sufficient to operate three 6.6-amp. arc lamps or the equivalent in incandescent units. All metal parts of the new device are of copper or bronze and all insulating parts are of special process porcelain to provide high dielectric strength.

A New All-in-One Electric Outlet Box with several interesting features is announced by the Triplex Electrical Manufacturing Company, Chicago, Ill. It is supported by two rods instead of one to insure that the box remains perfectly plumb, avoiding crooked switch or receptacle plates. Slots on the cover receive lathe ends, preventing loose lathes. The cover slips on in slots provided for it and is locked on securely by clinching the clips. There are no bolts, nuts or screws and the strength of the rods and the rod supports prevents breaking plaster when wires are being pulled. It is claimed by the manufacturer that the electrician's time is saved by having no hangers to bolt on, no covers to screw on, no nuts, bolts or screws to fumble with.

Electrical Patents

Announced by U. S. Patent Office

17,386 (reissue). MEANS OF HEATING ENCLOSURES ELECTRICALLY; Clarence L. Burgler, New York, N. Y. App. filed Feb. 21, 1928 (1,660,218).

17,388 (reissue). ELECTRIC FURNACE; Frank T. Cope and Roland F. Benzinger, Sale, Ohio. App. filed Nov. 1, 1927 (1,647,726).

17,391 (reissue). THERMOSTATIC CONTROL FOR ELECTRICALLY HEATED APPARATUS; Albert T. Whittier, Bristol, Conn. App. filed May 21, 1929 (1,713,578).

(Issued July 30, 1929)

1,722,284. INCASED ELECTRIC MOTOR; Grover Leo Fisher, Sandusky, Ohio. App. filed Oct. 19, 1925.

1,722,295. DRUM CONTROLLER; Richard B. Hunter, Shorewood, Wis. App. filed Jan. 7, 1926.

1,722,296. CONTROLLER FOR ELECTRIC MOTORS; Richard B. Hunter, Shorewood, Wis. App. filed Jan. 7, 1926.

1,722,325. CONDENSER; Wm. Dubilier, New Rochelle, N. Y. App. filed Feb. 14, 1924.

1,722,326. VARIABLE CONDENSER; Wm. Dubilier, New York, N. Y. App. filed June 10, 1924.

1,722,353. CONNECTING TERMINAL FOR ELECTRICAL CONDUCTORS; Wm. Harry Ray, Chicago, Ill. App. filed Dec. 7, 1925.

1,722,362. METHOD OF WINDING COILS; Schuyler Colfax Wiley, La Grange, Ill. App. filed Nov. 30, 1926.

1,722,364. RAILWAY TRAFFIC—CONTROLLING APPARATUS; Henry S. Young, Wilkinsburg, Pa. App. filed April 21, 1927.

1,722,393. ELECTRICAL DEVICE; Albert H. Post, Waterbury, Conn., and Swan August Swanson, New York. App. filed Dec. 13, 1926.

1,722,419. SYSTEM FOR DISTRIBUTION OF ELECTRIC ENERGY; Otto Heinisch, Wesel and Anton Riedl Cleve-Rhineland, Germany. App. filed Nov. 2, 1925.

1,722,444. CONNECTING TRANSFORMER OF SHELL TYPE; Willi Reiche, Dresden, Germany. App. filed Oct. 21, 1926.

1,722,472. ELECTRICAL DISTRIBUTION SYSTEM; Luke F. Kennedy, Schenectady, N. Y. App. filed Dec. 8, 1925.

1,722,570. APPARATUS FOR TESTING AND OTHERWISE UTILIZING FILLER RODS; J. Birchard Green, Chicago, Ill. App. filed Jan. 21, 1926.

1,722,632. METHOD AND MEANS FOR MINIMIZING FIRE IN DYNAMO—ELECTRIC MACHINERY; Josiah F. Johnson, Swarthmore, Pa. App. filed July 16, 1923.

1,722,640. ELECTRIC LAMP; Zelie Riddle, San Diego, Calif. App. filed Oct. 27, 1924.

1,722,672. INSULATOR SUPPORTING BRACKET. Elmer W. Lundell, Pittsburgh, Pa. App. filed May 1, 1926.

1,722,737. ELECTRIC-LIGHTING DEVICE; Reuben Eckstein and Max Polis, New York, N. Y. App. filed Sept. 1, 1928.

1,722,319. OVEN AND THE LIKE; Stephen S. Thomas, Lebanon, Ohio. App. filed Oct. 3, 1927.

1,722,333. MECHANICALLY OPERATED ALARM AND SIGNAL DEVICE; Claude Mamet, Paris, France. App. filed Oct. 25, 1926.

1,722,343. LIQUID FOR ACCUMULATORS; Gustav Achmans, Prague, Czechoslovakia, App. filed Aug. 20, 1928.

1,722,415. COMBUSTION CONTROL; Jefferson C. Gibson, Chicago, Ill. App. filed June 25, 1927.

1,722,430. ADJUSTMENT PLATE FOR OUTLET BOX CLOSURES; John A. Kelly, Lakewood, Ohio. App. filed June 5, 1926.

1,722,452. ELECTRICAL SWITCH; Charles Bollinger, Chicago, Ill. App. filed April 4, 1924.

1,722,511. RESISTOR; Melvin E. Vansickle, Newark, N. J. App. filed Feb. 23, 1927.

1,722,579. ELECTRIC HEATER; Ernest S. Johnson, Webster City, Iowa. App. filed Feb. 27, 1928.

1,722,582. D. C. RAILWAY SYSTEM; Ulrich Kloss, Berlin, Germany. App. filed March 22, 1928.

1,722,622. JUNCTION BOX FOR ELECTRIC FIXTURES; Peter Bilz, New York, N. Y. App. filed Jan. 26, 1923.

1,722,642. MAGNETIC SWITCH; Olof Thompson, New York, N. Y. App. filed April 13, 1926.

1,722,709. SWITCH MECHANISM; Edwin A. Robertson, Lake Wawasee, Ind. App. filed Sept. 10, 1927.

1,722,711. TUBE-WELDING MACHINE; Frank L. Sessions, Lakewood, Ohio. App. filed Sept. 27, 1922.

1,722,741. TIME DELAY UNDER-VOLTAGE RELEASED; Benjamin E. Getchell, Plainville, Conn. App. filed July 3, 1926.

1,722,743. ELECTRIC-LIGHTING SOCKET; Edwin F. Guth, St. Louis, Mo. App. filed Dec. 6, 1927.

1,722,749. POLARIZED RELAY; Frederick C. Holtz, Springfield, Ill. App. filed Aug. 30, 1924.

1,722,756. MEANS FOR CORRECTING TEMPERATURE ERRORS IN ELECTRIC METERS; Fred Kurz, Springfield, Ill. App. filed Nov. 12, 1926.

1,722,768. THERMAL RELAY; Eberhard Schnetzler, Hanan-on-the-Main, Germany. App. filed Aug. 22, 1927.

1,722,816. CABLE CONNECTION FOR PORTABLE TOOLS; Leon F. Meunier, Cleveland, Ohio. App. filed July 17, 1925.

1,722,887. ELECTRIC SUSPENSION INSULATOR; Otto Becker, Berlin-Hennigsdorf, Germany. App. filed July 31, 1924.

1,722,900. BATTERY CHARGING DEVICE; Julius Cowen, San Antonio, Tex. App. filed June 30, 1922.

1,722,915. SIGN RECEPTACLE; William F. Hendry, Ossining, N. Y. App. filed Jan. 7, 1927.

New Trade Literature

ELECTRIC APPLIANCES.—Catalog No. 3N issued by Landers, Frary & Clark, New Britain, Conn., includes the most distinctive and complete line of chromium-plated electric appliances on the market. Also included in this catalog are new "Universal" appliances in nickel plate, including urn sets, automatic toaster, the combination waffle iron, griddle and sandwich toaster and the combination table stove and corn popper.

ARC-WELDING EQUIPMENT AND STEEL PANELS.—"Multiple-Operator Arc-Welding Equipment" is the title of leaflet L.20,421 issued by the Westinghouse Electric & Manufacturing Company, East Pittsburgh, Pa. The leaflet presents the application, distinctive features and general principles of the construction of different types of stationary and portable multiple-operator arch-welding sets. The company also is distributing folder No. 5179, which presents the many features of Westinghouse steel panels for switchboards. Photographs and diagrams point out the important advantages of steel panels over other kinds.

PIPE FITTINGS, ARC-WELDING SET, OIL PURIFIERS, ETC.—Circular No. 1676-B issued by the Westinghouse Electric & Manufacturing Company, East Pittsburgh, Pa., describes the Westinghouse fittings for pipe structures. The circular is well illustrated with photographs and drawings. The company also is distributing leaflet No. 20,418, describing its 300-amp., gas-engine-driven arc-welding set; leaflet No. 20,240C, covering the Sharples supercentrifuge oil purifiers; leaflet No. 20,420, describing the Baldwin-Westinghouse midget storage battery locomotive for mine haulage duty, and leaflet No. 20,340-B, covering its new 300- and 400-amp. single operator, portable and stationary welders.

METERS AND NETWORK PROTECTORS AND RELAYS.—"Registers of Revenue" is the title of circular No. 1753-A issued by the Westinghouse Electric & Manufacturing Company, East Pittsburgh, Pa. It contains a discussion of the origin and history of watt-hour meters; the requisites of a good watt-hour meter and its construction are explained; the need of subdivided metering is discussed with the aid of charts, OB meters, portable meters and remote-control meters with equipment are described and illustrated. The company also is distributing circular No. 1837, entitled "Recent Developments in Automatic Network Protectors and Relays," which consists of revised reprints from the *Electric Journal* and a list of distinctive features of the type CM-2 network protector.

ELECTRIC APPLIANCES.—The Edison Electric Appliance Company, Inc., 5600 West Taylor Street, Chicago, is distributing a catalog supplement No. Y575 showing fourteen new "Hotpoint" items added since the last catalog was printed. The company also has issued price lists covering the equipment.

MINE AND INDUSTRIAL LOCOMOTIVES.—The Westinghouse Electric & Manufacturing Company is distributing special publication 1841 on the various types of Baldwin-Westinghouse mine and industrial locomotives. This booklet contains illustrations, plans and data on Baldwin-Westinghouse locomotives recently placed in service in mines and with other industrial applications. This information is intended to provide executives and engineers with a valuable reference for the solution of their particular transportation problems.

AIR-COOLED TRANSFORMERS.—Bulletin No. 629 issued by the Sorgel Electric Company, Milwaukee, Wis., contains a complete discussion of the Sorgel line of air-cooled transformers. It discusses the full range of sizes from ¼ to 50 kva., made for single phase, two phase and three phase, enlarging upon the various applications, the outstanding features, the economy of convenient installations and the savings effected for the users.

TORCHWELD EQUIPMENT.—Catalog No. 29 covers the completed Torchweld line with cross-sectional views of gas welding and cutting, lead welding, soldering, brazing and carbonizing equipment, automatic and hand welding, cutting machines and torches, gas pressure regulators, acetylene generators and welding supplies.

GROUNDOMETERS.—Bulletin No. 110 issued by the Borden Electric Company, Newark, N. J., contains descriptive information on the type D groundometer, which is especially designed for measuring the resistance to the flow of current from a metal electrode into the surrounding earth. The bulletin contains an illustration of the wiring arrangement of the type D groundometer, discusses its construction in full and deals with the limitations of measurements.

MAGNETIC SWITCHES.—Catalog No. 114 issued by the Trumbull Electric Manufacturing Company, Plainville, Conn., includes changes and additions especially in respect to prices on 20- and 30-amp. magnetic switches. Changes include reductions in the list prices of thermal cutuots and links, the addition of four- and five-pole S.N. switches with open ends, the addition of back-connected switches with laminated studs, etc.

Foreign Trade Opportunities

Following are listed opportunities to enter foreign markets. Where the item is numbered, further information can be obtained from the Bureau of Foreign and Domestic Commerce, Washington, by mentioning the number:

An agency is desired in Helsingfors, Finland (No. 39,963), for storage batteries.

An agency is sought in Brussels, Belgium (No. 39,960), for household electrical appliances.

An agency is desired in Vienna, Austria (No. 40,073), for household electrical appliances.

An agency is asked for in Hamburg, Germany (No. 39,959), for household, restaurant and hotel appliances.

An agency is sought in Shanghai, China (No. 40,087), for farm-lighting outfits.

Purchase is desired in Havana, Cuba (No. 40,021), of electrical motors.

An agency and purchase are desired in Bloemfontein, South Africa (No. 39,957), of electrical refrigerators.

Purchase is sought in Havana, Cuba (No. 40,021), of electrical refrigerators.